DRAFT
ENVIRONMENTAL ASSESSMENT

CHESAPEAKE BAY
NATIVE OYSTER RESTORATION PROJECT
PIANKATANK RIVER
THE COMMONWEALTH OF VIRGINIA

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EXECUTIVE SUMMARY

The purpose of this document is to analyze the environmental impacts of the Chesapeake Bay Native Oyster Restoration Project that will take place in the lower Piankatank River. The project is part of the U.S. Army Corps of Engineers Chesapeake Bay Oyster Restoration program, which was authorized by Section 704(b) of the Water Resources Development Act (WRDA) of 1986, as amended. The ultimate goal of the program is to restore abundant, self-sustaining oyster populations in the Chesapeake Bay and its tributaries. The objective of this project is to construct reef habitat in the Piankatank River that closely resembles natural conditions, in terms of structure and function, in a technically and economically sound manner.

The project area is located in Middlesex and Mathews counties at the mouth of the Piankatank River where it discharges into the Chesapeake Bay proper. The Piankatank River is a medium-sized river located south of the Rappahannock River and north of the York River in the Middle Peninsula region of the Commonwealth of Virginia. The entire project area occurs on subaqueous land owned by the Commonwealth of Virginia and managed by the Virginia Marine Resources Commission.

The project will consist of the construction of new oyster reefs in the Piankatank River between 6-12 feet MLLW. The reefs would be constructed using artificial substrate materials, or a combination of the alternative substrate and oyster shell to construct new sanctuary oyster reefs. Alternative substrate materials that could be used to construct the new oyster reefs include concrete rubble (recycled concrete) and related "materials of opportunity" generated by demolition of concrete structures, granite, and shaped concrete structures (reef ball® type structures, pyramids, modules, and "castles," for example). If shaped concrete structures are used, they will need to be placed on hard bottom to avoid subsidence, and may perform better if placed on bottom hardened by placement of concrete rubble or small amounts of shell. The reefs would be built to an elevation of one foot above existing bottom.

Construction of the project will include temporary, minor impacts to air quality, water quality, the aquatic community, recreation, navigation and the level of noise experienced within the project area. It is predicted that these negative impacts will end once construction has been completed and most environmental parameters within the project area will return to pre-construction conditions. The project is predicted to result in experience long-term positive effects on some elements including increased habitat diversity and improvements to species associated with reef habitat, improved recreational opportunities

The long-term impacts resulting from the project are predicted to be largely beneficial. The new reef structures increase habitat heterogeneity and increase the amount of reef habitat within the river. The reef will increase productivity of the system and provide habitat for prey species, such as crustaceans, mollusks, worms and fish. Hard reef structures will provide cover and shelter for many species of fish and other motile invertebrates such as crabs and shrimp as well as attachment surfaces for sessile organisms.

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1.0 PROJECT PURPOSE AND NEED

The Piankatank River once contained 7,097 acres of Baylor oyster grounds (historic oyster habitat). Today, only 3,336 acres within those original Baylor grounds are still considered oyster habitat. The degradation of reefs has been linked to numerous causes including the removal of seed oysters, over harvesting of market oysters, sedimentation, disease, and limited effort to replace oyster shell over the years. The purpose of this project is to increase the population of native oysters in the Chesapeake Bay by designing and constructing oyster reefs in an environmentally, technically, and economically sound manner.

1.1 PROJECT AUTHORITY

This project was authorized by Section 704(b) of the Water Resources Development Act (WRDA) of 1986, as amended through Section 505 of WRDA of 1996, Section 342 of the WRDA of 2000, Section 113 of the Energy and Water Development Act of 2002, Section 126 of the Energy and Water Development Act of 2006, Section 5021 of WRDA 2007, and Section 4010 of the Water and Resources and Reform Act (WRRDA) of 2014. The authority allows for the restoration and rehabilitation of habitat for fish, including native oysters, in the Chesapeake Bay and its tributaries in Virginia and Maryland, include the construction of oyster bars and reefs; the rehabilitation of existing marginal habitat; the use of appropriate alternative substrate material in oyster bar and reef construction; the construction and upgrading of oyster hatcheries; and activities relating to increasing the output of native oyster broodstock for seeding and monitoring of restored sites to ensure ecological success.

1.2 PROJECT LOCATION

The Piankatank River is a Virginia tributary of the Chesapeake Bay. The Chesapeake Bay watershed covers about 64,000 square miles, which includes portions of six states and the District of Columbia. The Chesapeake Bay encompasses a total of 2,200 square miles and is approximately 200 miles in length. It is a relatively shallow estuary, with an average water depth of about 20 feet, although there are deeper areas up to 174 feet in depth (Lippson and Lippson, 1984).

The Piankatank River is a medium-sized river on the western shore of the Virginia portion of the Chesapeake Bay. The Piankatank River empties into the Chesapeake Bay about 60 miles east of Richmond, the capital of the Commonwealth of Virginia. It is located immediately south of the Rappahannock River and north of the York River in the Middle Peninsula region of the state. The Piankatank River's total watershed covers 887.5 square miles (142,000 acres or

2,298.6 km²) with most of the watershed being forests, wetlands, or farms. Overall, the watershed is the least developed of all in Virginia.

The proposed project area is located in the Piankatank River, at its confluence with the Chesapeake Bay. The site includes areas within both Middlesex and Mathews Counties. The project area includes approximately 3000 acres of the Piankatank River, from Roane Point in the west to Hills Bay in the east (Figure 1). Project sites that were considered include subaqueous areas located within Fishing Bay, Godfrey Bay, Hills Bay and Warehouse Cove.

FIGURE 1: VICINITY MAP OF THE PIANKANTANK RIVER PROJECT

1.3 PROJECT NEED OR OPPORTUNITY

The Eastern oyster (*Crassostrea virginica*) is a keystone species of the Chesapeake Bay. This shellfish sustained the region's most valuable commercial fishery for over a century, while playing an essential role in the environmental health of the bay. Oysters clean the waters of the bay and provide habitat for other aquatic species. Oyster populations throughout the Chesapeake Bay, including the Piankatank River, are at critically low levels. Losses have been attributed to overharvesting, disease, habitat loss and decreased water quality.

1.4 AGENCY GOAL OR OBJECTIVE

The objective of this project is to construct and rehabilitate reef habitat that closely resembles natural conditions in terms of structure and function in a environmentally, technically, and economically sound manner. The restoration of reef habitat will lead to the ultimate goals of the 704(b) program. These goals include the restoration of a self sustaining oyster population and improvement of the environmental quality of the Piankatank River.

This project will contribute to meeting the goals established for the restoration of the Bay as a whole. Restoration of an abundant, self-sustaining oyster population throughout the Chesapeake Bay has become a nationally recognized goal. The Chesapeake 2000 agreement established a goal that by 2010, a tenfold increase in native oysters in the Chesapeake Bay would be achieved. The Executive Order 13508, Chesapeake Bay Protection and Restoration, signed by President Obama in 2009, defined the goal for oyster restoration in Chesapeake Bay as successfully restoring oyster populations to 20 Bay tributaries by 2025. This has, in general, been interpreted to mean 10 tributaries in both states (Maryland and Virginia). Restoration activities in Virginia have included the Tangier-Pocomoke Sound, the Great Wicomico River, and the Lynnhaven River. However, to-date, no tributaries in Virginia are considered restored.

1.5 RELATED ENVIRONMENTAL DOCUMENTS

Final Decision Document Amendment, Chesapeake Bay Oyster Recovery Phase III, Great Wicomico River, Virginia. U.S. Army Corps of Engineers (USACE), Norfolk District. 2003.

Final Decision Document Amendment, Chesapeake Bay Oyster Recovery Phase IV, Lynnhaven River, Virginia. USACE, Norfolk District. 2005.

Final Programmatic Environmental Impact Statement for Oyster Restoration in Chesapeake Bay Including the Use of a Native and/or Nonnative Oyster. USACE. June 2009.

Restoration Goals, Quantitative Metrics and Assessment for Evaluating Success on Restored Oyster Reef Sanctuaries. Report to the Sustainable Fisheries Goal Implementation Team of the Chesapeake Bay Program (CBP). Oyster metric Workgroup (OMW). October 2011.

Final Programmatic Native Oyster Restoration Master Plan for the Recovery of the Eastern Oyster (*Crassostrea virginica*) in the Chesapeake Bay, USACE. November 2011.

Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan Maryland and Virginia, USACE, Baltimore and Norfolk Districts, September 2012.

2.0 ALTERNATIVES

This section describes in detail the no-action alternative (NAA), the proposed action, and other reasonable alternatives that were studied. Based on the information and analysis presented in the sections on the Affected Environment and the Environmental Impacts, the beneficial and adverse environmental effects of all alternatives are presented in comparative form. This will provide a clear basis for decision makers to select the proposed action.

2.1 DESCRIPTION OF ALTERNATIVES

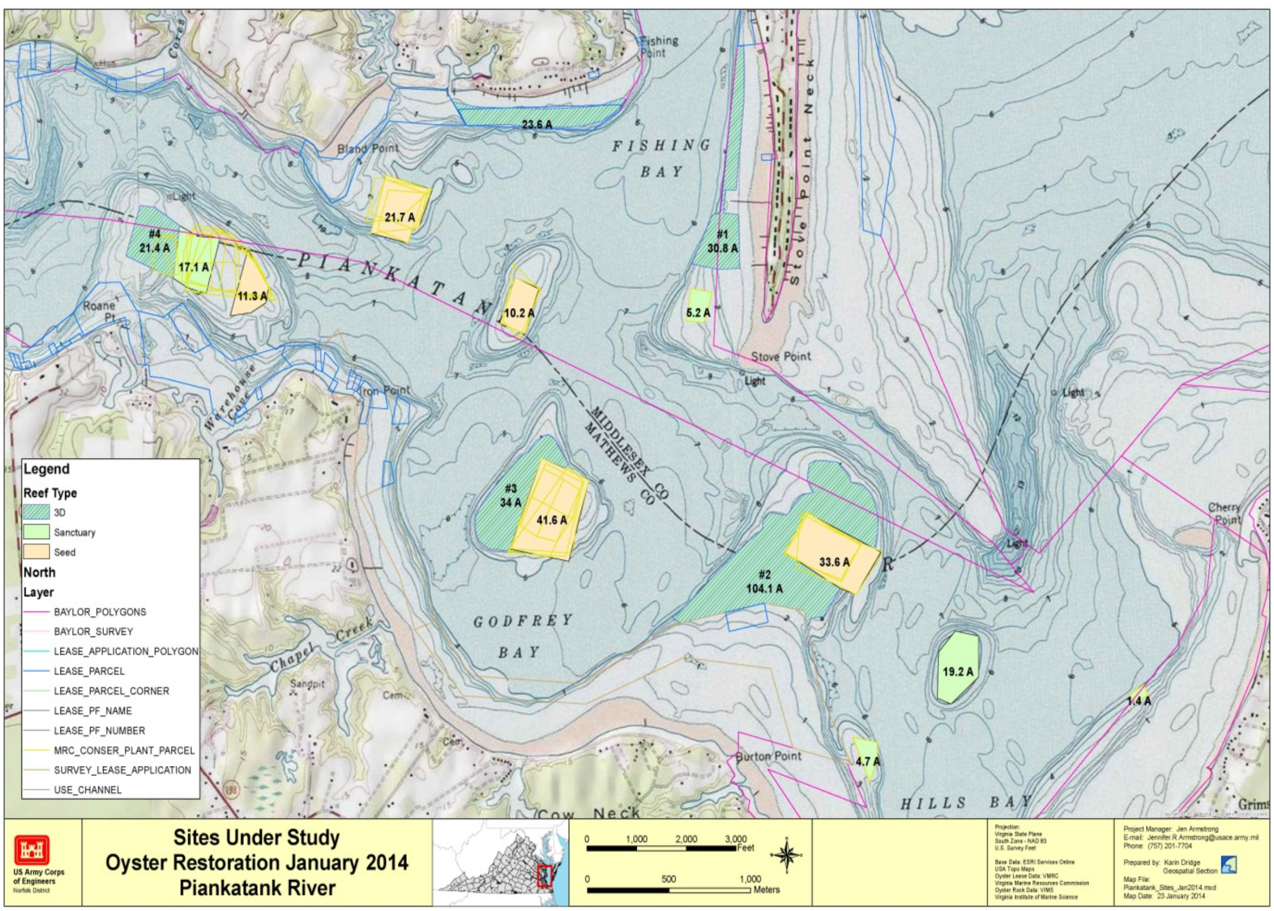
2.1.1 Alternative A – Rotational Harvest Grounds. This alternative consists of constructing areas entirely of oyster shell and operating those areas as rotational harvest grounds open to commercial fishing. Rotational harvest grounds could include the placement of shells as well as young "seed" or "spat-on-shell" oysters to enhance the commercial fishery. Besides the initial construction of habitat, maintenance of harvested habitat through regular application of additional shells is included in this alternative. These reefs would be re-shelled through the state's "repletion" program. Rotational harvest grounds have been show to provide limited ecological benefits (Kjelland 2014).

2.1.2 Alternative B – Construction of New Sanctuary Reefs with Alternative Substrate. This alternative consists of the construction of new sanctuary reefs at 6-12 feet MLLW in the lower Piankatank River. The reefs will be built using artificial substrate materials, or a combination of the alternative substrate and oyster shell to construct new sanctuary oyster reefs. Considering post-construction settling of material, reefs will be built to an elevation of one foot above existing bottom. If settling occurs post-construction, additional material may be placed on these reefs as an adaptive management measure to ensure the height of the reef is at an elevation of one foot above the existing bottom. Specific locations for the placement of reefs will be based on conditions where settling is not anticipated.

Using data collected by National Oceanographic and Atmospheric Administration (NOAA) and information provided by Virginia Marine Resources Commission (VMRC), it is estimated that the project area contains more than 130 acres appropriate for the construction of new oyster reefs. In Figure 2, the light green area, labeled "3-D", illustrates those sites. New sanctuary reefs would be constructed on unvegetated sites that do not contain existing oyster reefs or remnants of previously existing reefs. Also, privately leased grounds, docks and maintained navigation channels will be avoided, as will beds of submerged aquatic vegetation and other significant marine resources. Once constructed, these reefs would be recognized and protected by VMRC, the agency that manages submerged bottom and the oyster harvest within the Commonwealth of Virginia, as oyster sanctuaries, where harvesting would be prohibited. The Commonwealth of Virginia will be responsible for ensuring that project areas are retained in public ownership and protected for uses compatible with the authorized purposes of the project. These responsibilities will be included in the cost share agreement to be executed between the federal government and the non-Federal Sponsor.

Alternative substrate materials that could be used to construct the new oyster reefs include concrete rubble (recycled concrete) and related “materials of opportunity” generated by demolition of concrete structures, granite, limestone marl, and shaped concrete structures (reef ball® type structures, pyramids, modules, and “castles,” for example). The size of the alternative substrate would vary depending on the material. Concrete rubble, granite and other similar materials would be no smaller than 3 inches in diameter; while large concrete structures could be up to 6ft in height. If shaped concrete structures are used, they will need to be placed on hard bottom to avoid subsidence, and may perform better if placed on bottom hardened by placement of concrete rubble or small amounts of shell. Alternative materials can be used to create reef bases with shells placed on top, or be used to construct the entire reef, depending on the source of material or the material’s size.

Figure 2: EXISTING AND PROPOSED OYSTER REEF SITES IN THE MOUTH OF THE PIANKATANK RIVER.



2.1.3 Alternative C – Construction of Sanctuary Reefs Using Fossil Shell Only. This alternative consists of constructing sanctuary reefs entirely of shell. The source of this shell could include dredging reserves of fossilized shell from a permitted location in the James or its tributaries or from shell collected from restaurants, also known as “house” shell. The project sites would be the same as described in Alternative B and the design of the new reefs would also be identical to the design in Alternative B. The only difference would be that new reefs would not be constructed of alternative substrate, but entirely of oyster shell. New sanctuary reefs will be built to a height of 12 inches above the river bottom.

2.1.4 Alternative D - No Action Alternative. A NAA was also evaluated. Under this approach, the proposed sanctuary reefs structures would not be constructed. There is growing interest in restoration of the oyster resources in the Piankatank River by some non-profit organizations, such as The Nature Conservancy. These organizations rely on private donations and typically do not have the funding to support restoration projects the size of the proposed effort. It is possible the small restoration projects will occur in the future. These efforts would work in conjunction with the proposed project to improve the environmental quality of the Piankatank River. It is also predicted that the state, through VMRC, would continue to implement a re-shelling program for the purpose of harvest management.

There is growing interest in restoration of the oyster resources in the Piankatank River by some non-profit organizations, such as The Nature Conservancy. These organizations rely on private donations and typically do not have the funding to support restoration projects the size of the proposed effort. These efforts would work in conjunction with the proposed project to improve the environmental quality of the Piankatank River. Future efforts by other organizations would most likely be on a much smaller scale that is too small to affect significant change or would be directed towards the management of the oyster harvest. Without the proposed project, the wild, oyster population in the lower Piankatank River area would remain degraded due to low population levels, disease, sedimentation, predation and ongoing fishing for a significantly longer period, without attaining restored status.

2.2 ISSUES AND BASIS FOR CHOICE

The chosen alternative will be determined through the consideration of a number of elements. First, the alternative must provide environmental benefits through the improvement of oyster habitat and must result in the expansion of the native oyster population in the Piankatank River. The alternative must also take into consideration that oyster shell, a material which is used in the construction and re-shelling of oyster reefs, is a limited resource. A project that would conserve oyster shell, but provide the same environmental benefits, would be preferred. The project must also be supported by the non-federal sponsor (VMRC), the public, stakholders and resource agencies. Since the main goal of the project is to provide environmental benefits to the Piankatank River, the chosen alternative also cannot result in significant long-term impairments to the ecosystem. Finally, the chosen alternative must comply with all appropriate environmental laws, Executive Orders, Chesapeake Bay Agreements, and USACE policy.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION

Alternative A (rotational harvest as a standalone alternative) was dropped from further consideration. The Piankatank River has traditionally been used as a "seed" estuary, providing seed oysters for both private grounds within the Piankatank as well as private grounds in other estuaries. Under this approach the project area would not naturally return to a productive state for oysters once these areas are harvested and will need to be supplemented with additional oyster shell. Although rotational harvest may provide temporary ecological benefits, these benefits are not sustainable and does not fully meet the criteria of an ecosystem restoration project. This scenario does not meet the project objectives and therefore has been eliminated from detailed evaluation.

Alternative C, construction of sanctuary reefs using fossil shell only, was also eliminated from consideration. The environmental benefits and impacts of this alternative are predicted to be identical to those of Alternative B; however, the use of alternative substrates in the construction of new oyster reefs provides additional advantages. First, the use of alternative substrate allows the reuse of material that is considered waste. Crushed concrete, limestone or granite, produced during the demolition of bridges, buildings and other structures, can be put to a constructive use instead of being placed in landfills. The reuse of waste materials could ultimately reduce the cost of the project. Prior to use, these materials would be inspected to ensure that they are clean, not containing trash, high levels of fine material or hazardous materials that would damage the environmental quality of the Piankatank River.

Another reason that supports the use of alternative materials for the construction of new sanctuary oyster reefs is that oyster shell is considered a limited resource in the Chesapeake Bay. The use of other materials will conserve the amount of shell which then can be used at sites where shell is essential and no other material can be used.

Poaching, or unauthorized harvesting, has been a significant problem on restored sanctuary reefs throughout Chesapeake Bay. Once poached, reefs rarely recover and instead enter a downward spiral leading to reef degradation and population collapse. Poaching would be limited or prevented on reefs made of alternative substrates due to the likelihood of damage to oyster harvesting gear. For this reason, the use of alternative substrates would be especially valuable where sanctuary reefs are located near existing harvest areas or in waterways where poaching is known to be an issue.

Alternative substrates also help protect the reef's oyster population from any instances of extensive natural predation due to large schools of cow-nose rays, which can devastate young oyster reefs. Because the rays cannot remove oysters that are fixed to hard structures such as concrete and granite, the risk to the oysters growing on alternative substrate would be lower.

Another benefit alternate substrate may provide over oyster shell is that burrowing organisms, such as the oyster drill, which predate on oysters may not be able to or desire to burrow into the more dense and thicker alternate substrate. Therefore, there may be a reduction in burrowing organisms that have detrimental effects on oysters. On reefs constructed using both shell and alternative substrate, the oysters fixed to alternative materials would act as a reserve population if predation diminished the remaining shell-fixed reef population. Because of the advantages provided by the use of alternative substrates, Alternative C has been eliminated from detailed evaluation.

2.4 PREFERRED ALTERNATIVE

The preferred alternative is Alternative B, which includes the construction of new sanctuary reefs. The new oyster reefs may be built with either alternative substrate only, or a combination of the alternative substrate and oyster shell.

2.5 COMPARISON OF ALTERNATIVES

For this Environmental Assessment (EA), the impacts of Alternative B and the no action alternative will be considered to convey the most comprehensive look possible and allow the most flexibility for implementation going forward. From this point forward in this document Alternative B will be referred to as the Preferred Alternative (PA). Table summarizes the impacts of the PA and the NAA on the human environment. See Section 4.0 Environmental Effects for a more detailed discussion of impacts of alternatives.

Table 1: SUMMARY OF DIRECT AND INDIRECT IMPACTS

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
GENERAL ENVIRONMENTAL EFFECTS		
PHYSICAL SETTING	Increases in the oyster population could result in local ecosystem changes that would counteract some of the cumulative effects of watershed development, overharvesting, disease, invasive species, and pollutant loading to the Bay, although the effects are likely to be small.	No significant impact.
HYDROLOGY	Small scale changes in hydrology, including water currents and shoreline erosion if reefs are build nearshore, immediately adjacent to the new structures. No large-scale alterations to the hydrology in the Piankatank River.	No significant impact.

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
WATER QUALITY	Short Term – Decreased water quality due to the disturbance of bottom sediment resulting from project construction. The activity may result in decreased levels of dissolved oxygen and increased amounts of total suspended solids and turbidity in the water column. These temporary impacts will dissipate quickly after construction has been completed. Long Term - Stabilization of the bottom sediments and the increase in the population of filter feeders will improve water quality by reducing turbidity and TSS.	No significant impact.
CLIMATE CHANGE	No measureable effect on climate change. Oysters are able to persist throughout the range of climatic conditions typical for the Bay.	No significant impact.
WILDLIFE RESOURCES		
BENTHIC COMMUNITY (Clams, worms, oysters, etc.)	Short Term – Injury or death of some aquatic organisms during construction of the project. Changes to normal behaviors are expected during construction. Motile organisms will leave the project area. Non-motile species will be buried under reef material. Changes to water quality may also temporarily impact benthic organisms. Sessile species will be buried under reef material. Long Term – Population increases are expected for reef dependant species, especially oysters. The transition of soft bottom habitat to reefs will result in a decrease in populations that rely on soft bottom habitat in the immediate area that reefs are constructed, but there are no expected changes to the benthic community in the entire project area. Improvements to water quality resulting from increased oyster populations will positively impact wildlife within the project area.	Populations of oysters and other reef dependent species will remain at existing low levels.

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
PELAGIC COMMUNITY (Fish, etc.)	Short Term – Potential for injury or death of aquatic organisms during construction of the project. Changes to normal behaviors are expected during construction. Motile organisms will leave the project area. Predatory behavior of species that rely on sight may be disrupted. Health impairments (e.g. gill clogging), injury or death may also occur during the construction phase. Long Term – Population increases are expected for reef dependant species and the entire reef community. The transition of soft bottom habitat to reefs may result in a decrease in populations that rely on soft bottom habitat. Improvements to water quality resulting from increased oyster populations will positively impact wildlife within the project area.	No significant impact
RARE, THREATENED, AND ENDANGERED SPECIES	Most RTE species will not be affected by the PA. Individuals animals within the project area may be negatively affected by the construction of the project (reduction of water quality, physical impacts with construction equipment and materials and disruption of normal behavior), but these species are highly mobile and will be able to move out of the construction zone. Impacts will halt once the construction has been completed.	No significant impact
INVASIVE SPECIES	The proposed project will have no effect on most invasive species.	No significant impact
HABITAT RESOURCE		
OYSTER REEF	Increase in reef habitat resulting to the creation of new oyster reefs. Existing oyster resources will be affected by the construction of the project as previously described for the "Benthic Community" and through the increase in spat as the oyster population increases.	No significant impact

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
ESSENTIAL FISH HABITAT	Short Term – Construction of the new reefs may result in decreased water quality due to the disturbance of bottom sediment and shell placement. The activity may result in decreased levels of dissolved oxygen and increased amounts of total suspended solids and turbidity in the water column. Construction may also cause changes in normal behaviors. These temporary impacts will dissipate immediately after construction has been completed. Long Term –The project will result in the transition of soft bottom habitat to reef habitat. Species which rely on reef habitat will benefit from the project, while species which rely on soft bottom will move to the appropriate habitat type. Existing reef habitat will be improved and new reefs will be created, which will benefit reef dependent species. HAPC – Individual sand bar sharks may be affected by the short term impacts described above, but given their mobility, sharks can avoid turbidity plumes and, if necessary, survive short-term elevated turbidity. Although some preferred habitat type of the sand bar shark will be altered to reef habitat, large areas of sandy bottom will remain available in the Piankatank River and the structure added to the system will benefit other EFH species.	No significant impact
SUBMERGED AQUATIC VEGETATION	As of 2012, no SAV beds are located within 0.25 miles of the closest reef site. Temporary adverse impact due to decreased water clarity during the construction phase could affect SAV beds if they are adjacent to the project site. Impacts will end when the construction phase is completed and water clarity returns to normal. Long-term, indirect benefits to the SAV community by improving water clarity and providing physical protection for plants, if beds are immediately adjacent to newly constructed reefs.	No significant impact
WETLANDS	The project will convert subtidal wetlands from unconsolidated bottom to reef habitat. The creation of new reefs may indirectly benefit adjacent subtibal wetlands, through improvements in water quality and increases benthic and overall secondary production.	No significant impact
OTHER RESOURCES		

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
HAZARDOUS, TOXIC & RADIOACTIVE WASTE	No significant impact.	No significant impact
AIR QUALITY	Temporary reduction in air quality caused by construction activities.	No significant impact.
NOISE	Temporary increase in noise cause by construction activities. Construction will only occur at during day light hours.	No significant impact
CULTURAL AND SOCIOECONOMIC RESOURCES	No adverse effects to cultural or socioeconomic resources are anticipated as a result of the implementation of this project.	No significant impact
HISTORIC AND ARCHAEOLOGICAL RESOURCES	No significant impact.	No significant impact
VISUAL, AESTHETIC AND RECREATIONAL RESOURCES	Short Term – Minor, temporary impacts to visual and aesthetic resources will occur during construction. Minor, temporary disruption of wildlife viewing, boating, and fishing during construction. Long Term –Minor benefits to recreational fishing for reef-oriented fish and waterfowl hunting where oyster density increase. Construction will result in shallower depths over the new reefs, which may require that vessels with deeper drafts navigate around the project sites. Signs will be placed to warn boaters of the location of the new reefs.	No significant impact
PUBLIC SAFETY	Short Term – Possible minor and local effects on public safety factors, such as increase risk of accidents due to boat traffic, will occur during construction phase. Long Term – Construction will result in shallower depths over the new reefs, which may require that vessels with deeper drafts navigate around the project sites. Signs will be placed to warn boaters of the location of the new reefs.	No significant impact

ENVIRONMENTAL FACTOR	ALTERNATIVE	
	Preferred Alternative Sanctuary Reefs Built with Alternative Substrate	No Action Alternative
COMMERCIAL NAVIGATION	Short Term – Minor interference with commercial traffic during construction activities. Long Term – Construction will result in shallower depths over the new reefs, which may require that vessels with deeper drafts navigate around the project sites. Signs will be placed to warn boaters of the location of the new reefs.	No significant impact

2.6 MITIGATION

This project is an ecosystem restoration project, with environmental benefits and no identified significant adverse impacts. Signage, warning boaters of the reefs, will be installed around the new reef sites in order to mitigate impacts to navigation and to ensure public safety.

3.0 AFFECTED ENVIRONMENT

This section describes the existing environmental resources of the areas that would be affected if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect or that would be affected by the alternatives if they were implemented. This section, in conjunction with the description of the "no-action" alternative, forms the base line conditions for determining the environmental impacts of the proposed action and reasonable alternatives.

3.1 GENERAL ENVIRONMENTAL EFFECTS

3.1.1 Physical Setting. The area surrounding the Piankatank River is located in the Coastal Plain Physiographic Province. It is a flat, low-relief region along major rivers and near the Chesapeake Bay. “The topography of the Coastal Plain is a terraced landscape that stair steps from the Fall Zone down to the coast and to the major rivers. This landscape was formed over the last few million years as sea level rose and fell in response to the repeated melting and growth of large continental glaciers and as the Coastal Plain slowly uplifted. The Virginia Coastal Plain is underlain by a thick wedge of sediments that increases in thickness from a feathered edge near the Fall Zone to more than 13,000 ft (4,000 meters) under the continental shelf. These sediments rest on an eroded surface of Precambrian to early Mesozoic rock.” Sixty six percent of this wedge is made up of late Jurassic and Cretaceous clay, sand, and gravel (College of William & Mary, 2014).

Soils in the Coastal Plain were developed from unconsolidated marine sediments and the texture of these soils is generally sandy silt from flood plain deposits, clayey silt on fluvial terraces, fine silty sand on higher marine terraces, and clayey silt from Coastal Plain. These soils are deep, but their drainage characteristics range from well drained to poorly-drained.

The climate of the Piankatank River is temperate with moderate, seasonal changes. Winters are generally mild, and summers, though long and warm, are frequently tempered by cool periods resulting from winds off the Chesapeake Bay and nearby Atlantic Ocean. Occasionally, during brief periods, the climatic conditions vary extremely due to storms of both extra-tropical and tropical origin. The average high temperature is 67 °F and the average low is approximately 46°F. The average annual precipitation is approximately 45 inches and is fairly evenly distributed throughout the year.

3.1.2 Hydrology. The mouth of the Piankatank River has many characteristics that make it an excellent site for oyster restoration. The Piankatank River has a history of heavy oyster recruitment despite lighter sets in the last 20 years), contains acceptable temperature, salinity, and dissolved oxygen (DO) ranges, is not a highly-developed watershed (especially upriver – Dragon Run), and produces oysters with good overall condition. The hydrology of the river also makes it a prime site for restoration efforts, because it is considered a “trap estuary”. The mouth of the river is long and narrow, with a tight bend near the mouth. This configuration creates gyre-like circulation, which promotes retention of oyster larvae and results in higher rates of oyster recruitment than in other tributaries (Andrews 1979).

3.1.3 Water Quality. The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and creating surface waters quality standards. The CWA requires each state to establish water quality standards for all bodies of water in its boundaries. Water quality standards must include a designated beneficial use or uses for each waterbody. In Virginia, all waters are designated for the following uses: 1) recreational uses, e.g., swimming and boating, 2) the propagation and growth of a balanced, indigenous population of aquatic life, 3) wildlife, 4) shellfishing, 5) fish consumption, and 6) public water supplies (where applicable) as described in Virginia State law 9VAC25-260-10. Recognizing the unique nature of the Chesapeake Bay, five additional sub-uses, which fall under the aquatic life use, are identified for the bay and its tidal tributaries. These uses include 1) migratory fish spawning and nursery, 2) shallow-water submerged aquatic vegetation, 3) open water aquatic, 4) deep-water aquatic life, and 5) deep-channel seasonal refuge.

Water quality in Chesapeake Bay is influenced by the characteristics of its watershed and by the interaction of physical, chemical, biological, and anthropogenic processes. The watershed drains a large area encompassing 64,000 square miles of streams, rivers, and land within parts of six states. The waters that flow into the Bay carry effluent from wastewater treatment plants and septic systems serving a population of 18 million people, and nutrients, sediment, and toxic substances from a variety of anthropogenic sources, such as agricultural lands, industrial discharges, automobile emissions, and power generating facilities. Five major rivers contribute 90% of the fresh water delivered to the Bay: Susquehanna, Potomac, Rappahannock, James, and York. Except for a few deep troughs associated with the ancient bed of the Susquehanna River, Chesapeake Bay is shallow, averaging 21 ft deep. This shallowness makes the Bay’s waters sensitive to temperature fluctuations, mixing events, and interactions with the sediments (Jasinski 2003).

The water quality of the Chesapeake Bay is impaired due to the negative impacts resulting from the development and land use within the watershed. The CBP reported on the health of the bay and found the following
(Chesapeake Bay Program 2010):

- 38% of the combined water volume of the Bay and its tidal tributaries met dissolved oxygen standards during the summer months;

- 18% of Chesapeake Bay tidal waters met or exceeded goals for water clarity, which was a decrease from 26% in 2009;

- 28% of the ninety tidal waterways analyzed in the Bay had no impairment for chemical contaminants;

- 72% of the waterways have a persistent problem with polychlorinated biphenyls (PCB)in fish tissue; and

- 22% of the tidal waters of the Chesapeake Bay had chlorophyll *a* concentrations that allow the growth of SAV.

It is estimated that 278 million pounds of nitrogen, 16 million tons of phosphorus and 9 million tons of sediment entered the Chesapeake Bay in 2010. These pollutants have a negative effect on the health of the bay by reducing water clarity and fueling the growth of algae that reduce dissolved oxygen in the water column. In December of 2010, the United States Environmental Protection Agency (USEPA) established Total Maximum Daily Load (TMDL) for nitrogen, phosphorus and sediment for the entire Chesapeake Bay. The TMDL was designed to ensure that all actions to control pollution entering the tidal rivers and the bay will be in place by 2025. The USEPA set annual allocations in the Piankatank River for total phosphorus (43,241 lbs/yr), TSS (10,176305 lbs/yr) and total nitrogen (418,650 lbs/yr).

The project area falls within the 26.07 square mile region identified by the Virginia Department of Environmental Quality (DEQ) as the Piankatank Mesohaline estuary. The project area is currently on the 2012 list of impaired waters. The area does not fully support all of the designated uses and is included on the Virginia “2012 305(b)/303(d) Water Quality Assessment Integrated Report”.

The Piankatank River does not support the aquatic life designated use due to low dissolved oxygen levels. The river was first listed for dissolved oxygen in 2002. The causes of this impairment include agriculture, atmospheric deposition of nitrogen, industrial point source discharge, internal nutrient recycling, loss of riparian habitat, municipal point source discharges, sources outside state jurisdiction or borders and wet weather discharges (point source and combination of stormwater, sanitary sewer overflow [SSO] or combined sewer overflow [CSO]).

The river also does not support the Aquatic Life, Shallow-Water Submerged Aquatic Vegetation designated use. The Piankatank River has failed to meet the Submerged Aquatic Vegetation acreage requirements and the Water Clarity Acreage criteria since the standards were adopted in 2006. The causes for this impairment include agriculture, atmospheric deposition of nitrogen, industrial point source discharge, internal nutrient recycling, loss of riparian habitat, municipal point source discharges, sources outside state jurisdiction or borders and wet weather discharges (point source and combination of stormwater, SSO or CSO)

The full 26.07 square miles of the Piankatank River is impaired for fish consumption due to the PCB found in the tissue of fish collected from the site. This impairment is common to most of the waters of Chesapeake Bay. No more than two meals per month are recommended of anadromous (coastal) striped bass caught in the Chesapeake Bay and its tidal tributaries. The Virginia Department of Health (VHD) also issued additional fish consumption advisory for PCBs in the Piankatank River from Rt. 17 to Deep Point Boat Landing. The agency recommends no more than two meals per month of gizzard shad. The source of this contamination is unknown.

Finally, a 1.17 square mile section of the Piankatank River downstream of Pond Point to just upstream of Iron Point does not meet the aquatic life designated use. In 2003, the estuarine bioassessment results indicated the benthic community was impaired. The causes of this impairment have been determined to be changes in ordinary stratification and bottom water hypoxia and anoxia. Other unknown causes might also play a role in this impairment.

3.1.4 Climate Change. The Chesapeake Bay region has begun to feel the effects of a changing climate. Some of the effects of climate change, such as sea level change (SLC) and increased temperatures have been recorded in both the Chesapeake region and throughout the world. Other possible impacts of climate change on the Bay include lower DO levels, more precipitation, higher greenhouse gas levels, and changes in wildlife abundance and migration patterns. Many species such as oysters will deal with the interaction of several climate change effects, which could impact their ability to survive in the Bay region.

Historically, the region’s climate has tended to shift between wet and dry conditions over several years. That is, wet or dry years tended to occur in clusters through time. During the last ten years, however, rainfall patterns have shifted between wet and dry years more randomly according to United States Geological Survey (USGS). These unpredictable changes in climate are expected to become more prevalent as average global temperatures rise, following the current trend (Jones and Moberg 2003). According to the U.S. Global Change Research Program, “global temperature rise is very likely to be associated with more extreme precipitation and faster evaporation of water, leading to greater frequency of both very wet and very dry conditions (U.S. Global Change Research Program 2014). Precipitation, particularly in winter and spring, could increase as the climate changes. Wetter conditions often cause more nutrients and sediment to flow into the Bay, which could further diminish water quality and fuel the growth of more algae blooms. More fresh water flowing into the Bay could lead to stronger stratification between bottom and surface waters, not allowing deeper waters to mix with oxygen-rich surface waters. Additionally a greater influx of freshwater would reduce salinity levels which could reduce the range of habitat oysters could tolerate. However changes in salinity also affect the distribution and intensity of MSX and Dermo disease, two diseases that affect oysters. Disease is generally less virulent in years of high rainfall due to decreased salinity. Increased salinity in the Bay would likely expand the range of the oyster further upriver in tributary rivers and further up-Bay in Maryland, along with their diseases and predators.

Impacts of higher temperatures could allow summer DO conditions to worsen, since warmer water temperatures are able to hold less oxygen. Less oxygen could affect the abundance of oysters, which require certain oxygen levels to survive.

Scientists from the Smithsonian Environmental Research Center (SERC) have found evidence that Eastern oysters are becoming smaller and less robust as greenhouse gases alter the acidity of water in estuaries and ecosystems where they live. When excess CO_2 is pumped into the atmosphere and dissolves into seawater, acidification (lowering of pH) of the oceans occurs. A byproduct of acidification is carbonic acid which rapidly converts to carbonate and bicarbonate ions, which are corrosive to the calcium carbonate shells of oysters. With less calcium in their shells, juvenile oysters take longer to mature, floating longer on the water's surface and making them easy prey to other animals. As the oceans become more acidic, scientists attest that it is possible that these shells will become weaker and could possibly dissolve over time (Berman 2008).

Change in sea level is predicted to continue in the future as the global climate changes. A recent study conducted for the Corps of Engineers by the Virginia Institute of Marine Science (VIMS), entitled "Chesapeake Bay Land Subsidence and Sea Level Change" (Boon et al., 2010) predicts a change in relative sea level rise (SLR) ranging from .114 in/year to .22 in/year in the Chesapeake Bay. This equates to approximately one half foot to one foot of sea level rise over the next 50 years. Additionally, USACE recently issued EC 2-2-211, "Incorporating Sea-Level Change Considerations in Civil Works Program". This USACE guidance document provides three different accelerating eustatic, (worldwide changes in sea level) SLC scenarios: a conservative scenario (historic rate of sea level rise), an intermediate scenario and a high scenario. The scenarios presented in the USACE guidance estimate SLR thru 2065 to be .73 feet for the conservative approach, 1.14 feet for the intermediate approach and 2.48 feet for the high scenario.

3.2 ENVIRONMENTAL RESOURCES

The proposed project is entirely aquatic; therefore this document will not address terrestrial environmental resources.

3.2.1 Wildlife Resources.

3.2.1.1 Benthic Community – Due to their three dimensional structure, oyster reefs provide habitat for a diverse community of benthic organisms. Invertebrate species that inhabit oyster reefs include hooked mussels (*Ischadium recurvum*), barnacles, sea squirts, mud crabs, blue crabs (*Callinectes sapidus*), polychaete worms, amphipods, grass shrimp (*Palaemonetes spp.)* and sponges.

Much of the project area does not contain oyster reefs and is instead unvegetated, sandy bottom. Although not as diverse as oyster reefs, a large number of organisms inhabit this habitat type. Common invertebrates found in nearshore, open seafloor habitat of Chesapeake Bay include brown shrimp (*Panaeus aztecus*), pink shrimp (*P. duorarum*), white shrimp (*P. setiferus*), horseshoe crab (*Limulus polyphemus*), amphipods, hard clams (*Mercenaria mercenaria)*, and soft-shelled clams (*Mya arenaria*).

A number of benthic species that inhabit the project area are economically important. The Commonwealth of Virginia offers commercial licenses for the harvest of a number of benthic organisms, including the American oyster (*Crassostrea virginica*), blue crab, hard clams, soft clams, surf clams (*Spisula solidissima*), channeled whelks (*Busycotypus canaliculatus*), and lobster (*Homarus americanus*). Benthic organisms support a significant part of the seafood industry in Virginia. The VMRC reports that more than 48,000,000 pounds of shellfish harvested commercially was landed in 2010, which was valued at over $124,000,000 (VMRC, 2010).

3.2.1.2 Fish - Fish species found in the mouth of the Piankatank River include pelagic species, those found in the water column and benthic species, fish associated with the ocean floor. Common species include the bluefish (*Pomatomus saltatrix*), summer flounder (*Paralicthys dentatus*), black sea bass (*Centropristus striata*), Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), Northern puffer (*Spheroides maculates),*and cownose ray (*Rhinoptera bonasus)*. Species which are found in the Chesapeake Bay which live on oyster reefs include naked gobies (*Gobiosoma bosc*), and striped blennies (*Chasmodes bosquianus*) (Harding and Mann 2001)

In 1996 and 1997, VIMS studied the Palace Bar Reef in the Piankatank River. This study included the collection of both pelagic and benthic fish. In total, thirty-one fish species representing twenty five families were collected at on or near Palace Bar Reef. The four most abundant pelagic species that were collected during this study were Atlantic croaker (*Micropogonias undulatus*), bluefish, striped bass (*Morone saxatilis*), and spot (*Leiostomus xanthurus*) (Mann and Harding 1998).

The Piankatank River is used by five different anadromous species of fish. These include the alewife (*Alosa pseudoharengus)* and the blueback herring *(Alosa aestivalis),* both of which are federal candidate species. The three other anadromous fish species that use the river are the American shad *(Alosa sapidissima*), striped bass, and yellow perch (*Perca flavescens*).

3.2.1.3 Rare, Threatened, and Endangered Species - Species of plants and animals that have been designated as rare, threatened, or endangered (RTE) are protected under Federal and State regulations. The Endangered Species Act (ESA) of 1973 (16 USC 1531-1543) regulates activities affecting plants and animals classified as endangered or threatened, as well as the designated critical habitat of such species. Federal agencies are required to provide for the conservation of threatened and endangered species and are prohibited from carrying out any action that would jeopardize a listed species or destroy or alter its critical habitat. The ESA was reauthorized in 1988, and its provisions apply only to species listed in the Federal Register as endangered or threatened. An "endangered species" is any species that is in danger of extinction throughout all or a significant portion of its range. Threatened species are defined as species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges. Actions affecting species proposed for listing require the same coordination with State and Federal agencies as actions affecting listed species. United States Fish and Wildlife Service (USFWS) and NOAA are the Federal agencies responsible for ESA compliance. Overall, USFWS is responsible for terrestrial and freshwater species and migratory

Table 2: FEDERAL AND STATE LISTED SPECIES THAT ARE KNOWN OR LIKELY TO OCCUR WITHIN A 3 MILE RADIUS AROUND THE PROJECT AREA.

Common Name	Scientific Name	Status*
Sturgeon, shortnose	*Acipenser brevirostrum*	FESE
Sturgeon, Atlantic	*Acipenser oxyrinchus*	FESE
Turtle, Kemp's ridley sea	*Lepidochelys kempii*	FESE
Turtle, leatherback sea	*Dermochelys coriacea*	FESE
Turtle, loggerhead sea	*Caretta caretta*	FTST
Plover, piping	*Charadrius melodus*	FTST
Beetle, northeastern beach tiger	*Cicindela dorsalis dorsalis*	FTST
Turtle, green sea	*Chelonia mydas*	FTST
Rail, black	*Laterallus jamaicensis*	SE
Salamander, eastern tiger	*Ambystoma tigrinum*	SE
Falcon, peregrine	*Falco peregrinus*	ST
Sandpiper, upland	*Bartramia longicauda*	ST
Shrike, loggerhead	*Lanius ludovicianus*	ST
Sparrow, Henslow's	*Ammodramus henslowii*	ST
Salamander, Mabee's	*Ambystoma mabeei*	ST
Treefrog, barking	*Hyla gratiosa*	ST
Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
Knot, red	*Calidris canutus rufa*	FP
Bat, northern long-eared	*Myotis septentrionalis*	FP
Alewife	*Alosa pseudoharengus*	FC
Herring, blueback	*Alosa aestivalis*	FC
Eagle, bald	*Haliaeetus leucocephalus*	FS
Fritillary, Diana	*Speyeria diana*	FS
Terrapin, northern diamond-backed	*Malaclemys terrapin terrapin*	CC
Turtle, spotted	*Clemmys guttata*	CC
FE - Federally Endangered SE - State Endangered FP - Federal Proposed FS - Federal Species of Concern	FT - Federally Threatened ST - State Threatened FC - Federal Candidate CC- Collection Concern	
(Last Updated: November 14, 2014 using the VDGIF Fish and Wildlife Information Service.)		

birds, and NOAA protects marine species and anadromous fish. The Department of Agriculture, Animal and Plant Health Inspection Service, oversees listed terrestrial plants. The state regulation for the protection of sensitive species is the Virginia ESA. Under Section 7(a) of the ESA, Federal agencies are required to consult with USFWS and NOAA as well as resource agencies in all states within the potentially affected area to ensure that their actions are not likely to jeopardize the continued existence of designated endangered or threatened species or to adversely modify or destroy their critical habitats.

The Fish and Wildlife Information Service Database, managed by the Virginia Department of Game and Inland Fisheries (VDGIF) described 25 RTE species known or are likely to occur within a three mile radius around the project area. Many of these species have no association with the proposed project and will not be addressed further in this document. These species include the eastern tiger salamander, the peregrine falcon, the upland sandpiper, the loggerhead shrike, Henslow's sparrow, Mabee's salamander, the barking treefrog, the northern long-eared bat, the Diana fritillary, the spotted turtle and the migrant loggerhead shrike. Additional information on the RTE species that may be found in the project area and have an association with the proposed project can be found in Appendix A of this document.

3.2.1.4 Invasive Species - Invasive species are animals and plants that are not native to their current habitat and negatively affect the invaded ecosystem. As a threat to native species, they rank second, just after habitat destruction. About 42 percent of the native plants and animals listed as threatened or endangered in the United States are at risk of further decline because of invasive species (CBP 2014).

In the Bay region there are over 200 known or possible invasive species thought to cause serious problems. Forty-six of these were identified in 2001 as nuisance species, of which six pose the greatest threat to the Bay region's ecosystem. Two foreign oyster protozoan parasites, *Perkinsus marinus* (Dermo) and *Haplosporidium nelsoni* (MSX), are major sources of oyster mortality in the Chesapeake Bay. The eastern oyster has started to demonstrate limited immunity to these diseases in the Piankatank River, which are causing significant but declining mortality in some Bay area populations.

3.2.2 Habitat Resources

3.2.2.1 Oyster Resources - The Piankatank River once contained 7097 acres of Baylor oyster grounds (historic oyster habitat). Today, only 3336 acres within those original Baylor grounds are still considered oyster habitat. The degradation of reefs has been linked to numerous causes including the removal of seed oysters, over harvesting of market oysters, sedimentation, disease, and limited effort to replace oyster shell over the years.

The Piankatank River was, like most tributaries in Virginia waters, managed for market oyster production during the early years of wide-scale commercial fishing (1850-1930). Harvests of oysters within the Piankatank River followed the general pattern of overexploitation seen Bay-wide, and like all other regions in the Bay, the oyster reefs were severely degraded by the late 1800's and reduced to flattened footprints with little if any bottom relief.

This trend grew alarming enough to warrant intervention early in the 20th century. A large-scale shell planting program was initiated in 1931, and continues to this day throughout Virginia waters on various public oyster grounds. Over a 69 year period, approximately 7,200,000 bushels of shells have been planted in the river on its "oyster rock" in an attempt to maintain habitat integrity.

Seed oysters are young oyster, which are often transported out of the river to other areas for grow-out to market size. The production and subsequent removal of seed oyster from the Piankatank and Great Wicomico Rivers became extensive in the 1960's-1980's to compensate for a decline in seed production in the James River.

Currently, the Piankatank River contains a number of highly degraded reefs, which were once the basis of a vibrant commercial fishery in the region. The Virginia Oyster Stock

Assessment and Replenishment Archive (VOSARA) data web site provides current information about the oyster stocks of tributaries of the Chesapeake Bay collected by VMRC and VIMS. Currently, VOSARA show eight existing oyster reefs located within the project area, totaling 177 acres of reefs. The information on each reef provided by the VOSARA system is given in Table 3 below.

The ultimate restoration goal for the Piankatank River set out by the Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan is 700 to 1300 acres of restored oyster habitat. Prior to 2014, there were approximately 7 acres of sanctuary reefs constructed in the Piankatank River above Stove Point, a thin peninsula that demarcates most of the hydrodynamically retentive portion of the Piankatank River. During the summer of 2014, VMRC and the Nature Conservancy (TNC) constructed 22 acres of sanctuary oyster reef near Fishing Point using crushed concrete.

Table 3: EXISTING REEFS IN THE PROJECT AREA.

Reef	**Area** (Acres)	**Harvest Information**	**Recruitment**	**Overall Oyster Density** (2013)
Palace Bar A	38.523	Open for seed harvest with hand scraping from 2008 to 2013.	Overall, low to moderate. Notable recruitment events in 1999, 2002, 2010, and 2012.	>100/m2
Heron Rock	13.311	Open for seed harvest with hand scraping from 2008 to 2013.	Two notable recruitment events in 1999 and 2010.	30 /m2
Burton Point B	7.608	Closed for all oysters since 2004.	Low, with two recruitment events in 1999 and 2002.	>12/m2
Burton Point A	39.039	Closed for all oysters since 2004.	Consistently low, with a recruitment event in 2002.	>34/m2
Cape Toon	41.416	Closed for all oysters since 2004.	Consistently increasing since 2005.Recruitment events in 2002 and 2010.	> 95/m2
Bland Point	24.98	Open for seed harvest with hand scraping from 2008 to 2013.	Low to moderate, except for recruitment events in 2002 and 2010.	>95/m2
Palace Bar B	6.663	Open for seed harvest with hand scraping from 2008 to 2013.	Typically low, with recruitment event in 2002.	12/m2
Stove Point	5.218	Closed for all oysters since 2004.	Low except for recruitment events in 2002, 2010 and 2012.	>110/m2

3.2.2.2 Essential Fish Habitat - The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), 1996 revision, defines essential fish habitat (EFH) as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” The MSFCMA applies only to Federally-managed species. Under the MSFCMA, fishery management plans must identify and describe EFH for the fishery and minimize adverse effects on the fishery to the extent practical.

Table 4. <u>NOAA’S ESSENTIAL FISH HABITAT 10 MINUTE SQUARE GRIDS THAT THE PROJECT AREA FALL WITHIN</u>

North	East	South	West
37□ 40.0 N	76□ 10.0 W	37□ 30.0 N	76□ 20.0 W
37□ 40.0 N	76□ 20.0 W	37□ 30.0 N	76□ 30.0 W
37□ 30.0 N	76□ 10.0 W	37□ 20.0 N	76□ 20.0 W

EFH has been identified for seventeen fish species, including three skate species, in the project area, which falls within three separate three minute square grids (Table 4) (NOAA 2014). Table 5 provides a summary of EFH for those species. The table also indicates which ecosystem component(s) most closely relates to each species or its EFH. Appendix D includes a discussion of the life cycle, the status of the fishery, and the designated EFH and a summary of project impacts to each species.

The NOAA designated the entire Chesapeake Bay, including the project area, as “habitat area of particular concern” (HAPC) for the sandbar shark but not for any other Atlantic highly migratory species (HMS). HAPC is described in regulations as a subset of EFH that is rare; particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally-stressed area. The intent of the designation is to focus greater attention on conservation efforts. The lower Chesapeake Bay area is has been given this designation because it is an important nursery and pupping area for the sandbar shark.

Table 5: SUMMARY OF EFH WITHIN CHESAPEAKE BAY FOR 16 FEDERALLY MANAGED SPECIES.

Species	Life Stage *	Description of EFH	Description of HAPC	Ecosystem Component
Red hake (*Urophycis chuss*)	J, A	Juveniles: Substrates of shell fragments and live scallop beds in the lower Chesapeake Bay and Eastern Shore of Virginia. Adults: Bottom habitats of sand and mud.	None	Reef-oriented fish
Windowpane flounder (*Scophthalmus aquosus*)	J,A	Juveniles & Adults: Bottom habitats of mud or fine-grained sand in most of the tidal Chesapeake Bay	None	Soft-bottom Benthos
Summer flounder (*Paralichthys dentatus*)	L,J,A	Larvae: Tidal creeks and mouths. Juveniles: Lower estuaries in flats, channels, salt marsh creeks, and eelgrass beds. Adults: Estuary waters during the warmer months.	Juveniles and adults limited to native macroalgae, SAV, and fresh and tidal macrophytes in beds of any size within their EFH.	Soft-bottom Benthos SAV
Bluefish (*Pomatomus saltatrix*)	J,A	Juveniles: Estuaries used as nursery areas; seasonal in the Chesapeake Bay from May to October Adults: Estuaries from April to October Juveniles and adults are pelagic	None	Piscivorous fish
Black sea bass (*Centropristis striata*)	J,A	Juveniles: Rough bottom, shellfish and eelgrass beds, and artificial structures on sandy and shell bottoms in estuaries, salt marsh edges, and channels during spring and summer. Adults: Natural and artificial structured habitats, and sand and shell substrates in estuaries from May to October.	None	Reef-oriented fish
Atlantic Butterfish (*Peprilus tricanthus*)	E, L,J,A	Estuaries for eggs in spring and summer, larvae from summer through fall, juveniles from spring to fall, adults from summer to fall. All life stages are pelagic.	None	Planktivorous fish
Scup, porgy (*Stenotomus chryops*)	E, L,J,A	Juveniles: Bottom habitats of sand, mud, and mussel and eelgrass beds in estuaries during spring and summer. Adults: Inshore estuaries on various bottom substrates	None	SAV Reef-oriented fish

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Table 5. (Continued)

Species	Life Stage	Description of EFH	Description of HAPC	Ecosystem Component
Red drum (*Sciaenops ocellatus)*	E, L,J,A	Larvae: Estuarine wetlands such as flooded salt marshes, brackish marshes, tidal creeks, and SAV beds. Juveniles: Shallow backwaters of estuaries, which are used as nursery areas until the fish migrate to the deeper waters of the estuaries, river mouths, and oyster bars; found throughout the Chesapeake Bay from September to November. Adults: Shallow bay bottoms, oyster reef substrate or artificial reefs within coastal inlets, shoals and capes of the Chesapeake Bay and Eastern Shore of Virginia during the spring and fall.	Coastal inlets, barrier islands, and State-designated habitats where SAV is critical.	SAV Reef-oriented fish
Cobia (*Rachycentron canadum*)**	E,L,J, A	High-salinity bays, estuaries, seagrass beds, and coastal inlets.	None	Piscivorous fish
King mackerel (Scomberomorus cavella)**	E,L,J, A	Coastal inlets	None	Piscivorous fish
Spanish mackerel (*Scomberomorus maculates*)**	E,L,J, A	Coastal inlets	None	Piscivorous fish
Dusky shark (*Charcharinus obscurus*)**	L, J	Neonate/Early Juvenile: Shallow coastal waters, estuaries, and inlets to 25 m deep during April to July Late Juvenile/Sub-adult: Exposed nearshore water of Virginia and rarely enter the estuaries as a summer secondary nursery area. In areas from 20 to 200 m deep. Adult: Pelagic waters offshore Virginia/North Carolina border to the 200m isobath	None	Piscivorous fish
Sandbar shark (*Charcharinus plumbeus*)**	L, J, A	Neonate/Early Juvenile: Nursery areas in the shallow, coastal waters of Chesapeake Bay during March to July where salinity is greater than 22 ppt and temperatures greater than 70ºF	Important nursery and pupping grounds have been identified in shallow areas and the mouths of tributaries in lower Chesapeake Bay	Piscivorous fish

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Species	Life Stage	Description of EFH	Description of HAPC	Ecosystem Component
		Late Juveniles/Sub-Adults: Shallow, coastal waters		

Table 5. (Continued)

Species	Life Stage	Description of EFH	Description of HAPC	Ecosystem Component
Sandbar shark (*Charcharinus plumbeus*)** (Continued)		from the coast to the 80-feet isobath. Summer secondary nursery area from May to October in the lower Chesapeake Bay, VA, and the tidal creeks and lagoons along Virginia's eastern shore. Adults: Shallow, coastal waters from the coast to the 165-feet isobath		
Clearnose skate (*Raja eglanteria*)	J, A	Juvenile/Adult: Appear in Chesapeake Bay between April and December with peak abundance between May and August; most abundant near the Bay mouth during spring and summer; rarely appear in tributaries. Can be found in Chincoteague Bay (VA), and Sinepuxent Bay (MD) from May to November. Prefer habitats with soft bottom, rocky, or gravelly substrates in 7-15m of water, and salinities greater than 22 ppt.	None	Soft-bottom Benthos
Little skate (*Leucoraja erinacea*)	J, A	Juvenile/Adult: In lower Chesapeake Bay in December and in March and around the Bay mouth in high-salinity waters during April and May. Prefers sandy, gravelly, or muddy substrates	None	Soft-bottom Benthos
Winter skate (*Leucoraja ocellata*)	J, A	Juvenile/Adult: Found in Chesapeake Bay from December to April. Prefers habitats with a substrate of sand and gravel or sometimes mud	None	Soft-bottom Benthos

* Life stages: E = egg, L = larvae, J = juvenile, A = adult
** These coastal migratory pelagic species move through different habitats in open water based on their life-cycle requirements but also have EFH within Chesapeake Bay.

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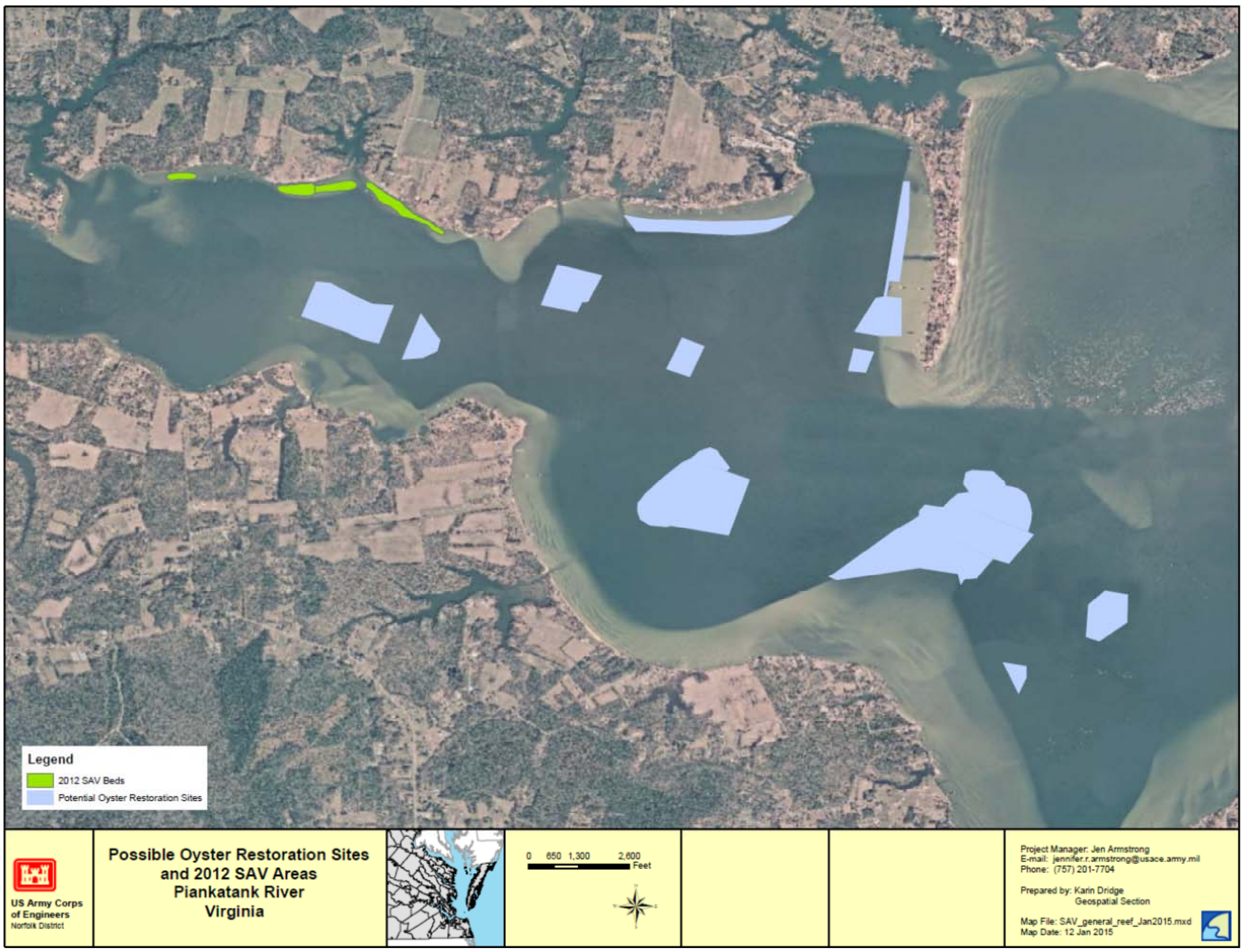
3.2.2.3 Submerged Aquatic Vegetation - The term submerged aquatic vegetation (SAV) refers to both marine angiosperms (the so-called true seagrasses) and freshwater macrophytes that occupy Chesapeake Bay and its tributaries (VIMS 2014). SAV encompasses 19 taxa from ten families of vascular macrophytes and three taxa from one family of freshwater macrophytic algae, the Characeae, but excludes all other algae. SAV are considered collectively, because monitoring data for SAV is recorded as an acreage in the Bay regardless of species. The SAV community of Chesapeake Bay and its tidal tributaries includes 15 species (exclusive of the algae).

Figure 3: THE LOCATION OF SAV BEDS IN THE PROJECT AREA.



SAV plays a critical role in the Chesapeake Bay ecosystem, serving as a sediment stabilizer, important habitat for juvenile fish and crabs, food for waterfowl, and a seasonal nutrient sink that can help offset the growth of algae. Oysters can interact with the SAV community indirectly by inducing changes in water quality and providing physical protection for plants. Filtration by oysters can increase the penetration of light through the water due to the removal of suspended sediment and phytoplankton, thereby potentially improving growing conditions for SAV. SAV is known to benefit from the presence of oyster reefs, which dampen wave energy (Turner et al. 1999; Heise and Bortone 1999). Historically, the presence of tall, three-dimensional oyster bars in fairly deep water may have reduced shoreline wave energy, thereby helping to prevent SAV from being dislodged or damaged.

SAV populations in the Chesapeake Bay today are greatly reduced in both density and abundance compared with levels documented in the early 1960s (Kemp et al. 2005). Declines are attributed to decrease water quality (increased amounts of suspended solids and dissolved nutrients), disturbances of SAV beds and alteration of shallow water habitat. This population decline has also been observed in the Piankatank River. In 1971, more than 1400 acres of SAV were surveyed. Currently, the number of acres of SAV that remain in the Piankatank River is much smaller; between 100 and 180 acres depending upon the year. As of 2012, the closest SAV beds are located more than 2000 ft away from the construction zones (Figure 3).

3.2.2.4 Wetlands - Wetlands are important ecological resources that improve and maintain water quality, reduce flood damage, and provide habitat for a wide variety of plants and animals, including many threatened and endangered species. Rapid loss of wetlands resulting from rural and urban development and rising sea level has prompted the Federal government and many State governments to regulate development activities in and near wetlands to preserve their important ecological functions. Section 404 of the Clean Water Act establishes regulatory authority governing the protection of wetlands at the Federal level and allows individual States to develop their own regulatory programs, which can be even more stringent. Virginia has developed regulatory programs that specifically address tidal wetlands. In 1974, USFWS created the National Wetlands Inventory Project (NWI) to map the location, type, and distribution of the nation's wetlands. The NWI uses the classification system of Cowardin et al. (1979) for wetland habitat type codes on its maps.

There are more than 7000 acres of wetlands located in the Piankatank River. All of the wetlands within the project area are identified as Estuarine. This designation includes "deepwater tidal habitats and adjacent tidal wetlands that are influenced by water runoff from and often semi-enclosed by land. They are located along low-energy coastlines and they have variable salinity". There are two types of Estuarine wetlands found within the project area. These include Intertidal wetlands, defined as the area from extreme low water to extreme high water and associated splash zone and Subtidal wetlands, which are habitats that are continuously submerged substrate.

Estuarine wetlands are particularly important habitats for brackish and marine fishes and shellfish, various waterfowl, shorebirds, wading birds, and several mammals. Many commercial and game fishes use estuarine marshes and estuaries as nursery and spawning grounds. Menhaden, bluefish, flounder, sea trout, mullet, croaker, and striped bass are among the most familiar fishes that depend on estuarine wetlands. Blue crabs and other shellfish, such as oysters, clams, and shrimp, also use coastal marshes for a variety of functions at various stages in their life cycles.

The most recognizable type of estuarine wetlands is the Emergent wetland, as identified by the NWI. Estuarine emergent wetlands, commonly called salt marshes, are characterized by grasses whose upper stems and leaves remain above the water's surface during high tides. Salt-tolerant grasses such as smooth cordgrass (*Spartina alterniflora*), salt hay grass (*Spartina patens*), big cordgrass (*Spartina cynosuroides*), and switchgrass (*Panicum virgatum*) generally dominate these wetlands. The nonnative grass known as common reed (*Phragmites australis*) is becoming a dominant plant species in many of the tidal emergent wetlands due to anthropogenic alterations of hydrology and inputs of sediment and nutrients (Marks et al. 1994).

The NWI indicates that the majority of the project area consists for subtidal wetlands. Oyster reefs are identified as subtidal wetlands; however most of the mouth of the Piankatank River is recognized as Unconsolidated Bottom. This wetland type includes area with less than 30 percent plant cover and at least 25 percent made up of bottom sediment that is smaller than stones (< 2.4 to 2.9 inches).

3.3 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

In the Bay, contamination of water and sediment occurs through urban point sources such as sewage and industrial outfalls, urban runoff, and atmospheric deposition. Domestic activities such as home and lawn maintenance, driving, and discarding unused household chemicals add to airborne and waterborne contaminants to the Bay. The nature, extent, and severity of toxic effects vary widely throughout the Chesapeake systems. Some toxic chemicals such as zinc, copper, and other metals occur naturally in soils and sediments. The most pervasive contaminants are metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel, and zinc), organic compounds, pesticides, and acid-mine drainage Chemicals typically travel through the watershed and are deposited in the Bay and its tributaries. Persistent chemicals may reach harmful levels when they continue to accumulate in the sediment at the bottom of the Bay.

Although high concentrations of contaminants may inhibit the development of larval oysters, weaken their immune systems, or create other health problems, oysters are relatively tolerant of many common pollutants (Capuzzo 1996; Roesijadi 1996), and population-level effects of contaminants have not been observed among oysters in the Chesapeake Bay. Oysters, however, may accumulate contaminants in their tissue, which could present a health hazard for humans who consume them. Metals are of particular concern because oyster tissue may accumulate metals to concentrations that are much greater than those in the surrounding water. The same is true of bacteria that enter the Bay via sewage discharges and land runoff. Although high concentrations of fecal bacteria do not affect the health of oysters, extensive areas of the Bay are closed to oyster harvest each year due to bacterial contamination

3.4 AIR QUALITY

Pollution in the air can affect the water quality and living resources of Chesapeake Bay. Contaminants are transferred to land or water through a process called atmospheric deposition. Airborne pollutants return to the earth's surface either by wet deposition (i.e., rain) or dry deposition, and are transported into streams, rivers, and the Chesapeake Bay by runoff or groundwater flow. Air pollution can be man-made or naturally occurring. Man-made sources of pollution include utilities, chemical and manufacturing plants, transportation, and agriculture. Natural sources of air pollution include pollutants emitted from plant life, erupting volcanoes, forest and prairie fires, and dust storms.

The USEPA is required to set air quality standards for pollutants considered harmful to public health and welfare. The primary National Ambient Air Quality Standards (NAAQS) set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, and prevention of damage to animals, crops, vegetation, and buildings. These standards have been established for the following six principal pollutants, called criteria pollutants (as listed under Section 108 of the Clean Air Act):

- Carbon monoxide (CO);
- Lead (Pb);
- Nitrogen dioxide (NO_2);
- Ozone (O_3);
- Particulate matter, classified by size as follows:
    - An aerodynamic size less than or equal to 10 microns (PM10);
    - An aerodynamic size less than or equal to 2.5 microns (PM2.5);
- Sulfur dioxide (SO_2)

The project area is located in the Northeastern Virginia Intrastate Air Quality Control Region (Chapter 20, Section 200). This Air Quality Control Region is in attainment for all criteria pollutants.

3.5 NOISE

Excess noise levels are not only annoying, but may cause adverse health effects in humans and disrupt wildlife behaviors. For purposes of regulation, noise is measured in dBA or A-weighted decibels. This unit uses a logarithmic scale and weights sound frequencies. Individuals with good hearing perceive a change in sound of three dBA as just noticeable, a change of five dBA as clearly noticeable and ten dBA is perceived as doubling (or halving) of the sound level.

The threshold of human hearing is 0 dBA. Values above 85-90 dBA would be considered very loud (Table 6) and have the potential to harm hearing given sufficient exposure time. Noise levels above 140 dBA can cause damage to hearing after a single exposure.

Many species in the Bay use noise to communicate, navigate, breed, and locate sources of food. The sensitivity varies among species, location, and season (e.g., breeding, migration, and roosting). Underwater noise influences fish and other marine animal behavior, resulting in changes in their hearing sensitivity, and behavioral patterns. Sound is important to them when they are hunting for prey, avoiding predators, or engaging in social interaction. Fish can also suffer from acoustically induced stress in their own habitat. Changes in vocalization behavior, breathing and diving patterns, and active avoidance of noise sources by marine life have all been observed in response to anthropogenic noise (Stocker 2002).

Table 6: TYPICAL NOISE LEVELS AND SUBJECTIVE IMPRESSIONS

Source	Decibel Level (dBA)	Subjective Impression
Normal Breathing	30	Threshold of hearing
Soft Whisper	30	--
Library	40	Quiet
Normal conversation	60	--
Television Audio	70	Moderately loud
Ringing Telephone	80	--
Snowmobile	100	Very Loud
Shouting in Ear	110	--
Thunder	120	Pain Threshold

The study areas for the proposed action are located within the Piankatank River, with varying distances to houses and other structures. As such, background noise levels in these areas are likely low (e.g., in the 30- to 40-dBA range). In terrestrial areas adjacent to the Bay, noise levels will vary depending on the level of urbanization and other factors. In a study done by the University of Maryland Center for Environmental Science (Wainger and Price, 2004), it was found that only a small portion of the inland area properties fall within the zone of occasional noise impacts (properties between 1,600-2,200 ft of project). Noise levels will vary depending on the time of day (e.g., rush-hour traffic) and location (residential versus commercial versus industrial areas, railroads, and major highways). Sensitive noise receptors in the vicinity include, residents living near the water.

3.6 CULTURAL AND SOCIOECONOMIC ENVIRONMENT

The cultural and socioeconomic environment of the Chesapeake Bay region is complex and diverse. Oysters play a variety of significant roles in this environment. The Eastern oyster is highly valued as a source of food, a symbol of heritage, an economic resource supporting families and businesses, and a contributor to the health of the Chesapeake Bay ecosystem. Harvesting, selling, and eating oysters has historically been a central component and driver of social and economic development in the region. From the colonial period to the 20th century, oyster harvests supported a vibrant regional industry, which in turn supported secondary industries, fishing communities, and a culinary culture centered on the bivalve.

Chesapeake Bay provides one of the primary focal points for tourism in Virginia. Recreation in the Bay region includes a wide range of activities such as hunting, fishing, sailing, hiking, touring historical landmarks, dining, and shopping. Domestic tourists spent $16.5 billion in Virginia These expenditures contribute significantly to the economies of each state, particularly by generating employment and tax revenue. Shared valuations of the Chesapeake Bay as an accessible, safe, clean recreational resource influence the benefits that surrounding states derive from recreational use of the Bay.

Despite the structural variations of the oyster fisheries in Maryland and Virginia and the effects of severely reduced harvest levels, oysters in Chesapeake Bay remain important culturally and economically at the regional, community, and household levels.

President Clinton issued Executive Order (EO) 12898, Environmental Justice, on February 11, 1994. Objectives of the EO, as it pertains to this evaluation, include development of Federal agency implementation strategies, identification of low-income and minority populations for which proposed Federal actions would have disproportionately large and adverse effects on human health and the environment; and participation of low-income and minority populations. A Presidential Transmittal Memorandum that accompanied EO 12898 referred to existing Federal statutes and regulations to be used in conjunction with the EO. The memorandum addressed the use of the policies and procedures of NEPA. Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the National Environmental Policy Act of 1969 [NEPA], 42 U.S.C. section 4321 et seq." Agencies are responsible for identifying and addressing, as appropriate, any disproportionately great and adverse effects of their programs, policies, and activities on the health of minority and low-income populations and their environments.

Based on recent survey work, no low-income or minority populations appear to be significantly involved in harvesting oysters in the Bay. Historically, significant numbers of African-Americans were employed in shucking houses, but today most shuckers are immigrant Hispanic workers. Most employment in the oyster industry today consists of harvesters, growers, and processors (including buyers); harvesters are the largest group. Although minorities participate in these activities, none dominate. Harvesters' incomes generally fall in the middle to lower-middle levels, and growers' and processors' into somewhat higher levels. There is no evidence of significant Native American involvement in oystering or the oyster industry in the Bay (M. Paolossi, University of Maryland, pers. comm.).

Within the context of this EA, any change in the Bay's oyster population that affects water quality and habitat in the Bay will affect all residents of the Bay area, regardless of minority or economic status. To the extent that minorities or low-income individuals are involved in oystering or in other components of the oyster industry, they would be positively affected by alternatives that result in increases in oyster populations or oyster-related businesses.

3.7 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Historic and archaeological resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for traditional, religious, scientific, or any other reason. These resources are discussed in terms of archaeological sites, which include both prehistoric and historical occupations either submerged or on land, and architectural resources. Archaeological sites become submerged when they are inundated following water level rise, e.g., after impoundment of rivers. Shipwrecks are a specific type of submerged archaeological site.

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (16 USC 470), governs Federal actions that could affect properties eligible for listing in the National Register of Historic Places (NRHP). Section 106 requires Federal agencies to consider the effects of their undertakings, including licensing and approvals, on NRHP-eligible properties and to afford the Advisory Council on Historic Preservation and other interested parties a reasonable opportunity to comment. As defined broadly by the regulations implementing Section 106 (36 CFR 800), "historic property" means "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior." Section 101(b)(4) of National Environmental Policy Act (NEPA) requires Federal agencies to coordinate and plan their actions so as to preserve important historic, cultural, and natural aspects of the country's national heritage.

The Chesapeake Bay and its estuarine tributaries, including the Piankatank River are the drowned valleys of the Pliestocene Susquahanna River and its tributaries. Following the Wisconsin Glaciation, subsiding about 13,300 years ago, sea levels rose to fill those valleys. During the glacial maximum, sea level was some 400 feet below current levels in Virginia. This was primarily due to the volume of water held in the continental glaciers which covered much of the northern hemisphere, but to a lesser degree the effect the weight those glaciers had. In areas just south of the glaciers the earth's crust bulged upward, responding to the weight of ice which could be miles thick. During the Wisconsin glacial period, not only was the Chesapeake Bay a mostly dry river valley, but the coast was some forty miles further east, to the edge of the continental shelf, and at that point it was some 200 feet down sheer cliffs to the sea. Fossils of extinct Pleistocene fauna, like mammoth and mastodon, have been found by trawler fishermen near the edge of the continental shelf (TRC Environmental Corporation 2012).

Earliest human settlement of the Americas is the subject of much debate among archaeologists. A growing number of sites in North and South America are yielding evidence pre-dating the long established Clovis culture's appearance some 12,500 years ago. In Virginia, the Catus Hill site in Dinwiddie County has artifacts dated to 17,000 years ago. More controversial is a leaf shaped biface, or spear-point, found in the scallop dredge of a trawler which had been dredging near Norfolk Canyon on the continental shelf many miles off Virginia. This artifact strongly resembles tools of the Solutrean culture, which is found in France and Spain, dating from 21,000 to 17,000 years ago. Some archaeologists argue that this artifact is evidence of people of the Solutrean culture having somehow crossed the Atlantic Ocean in this early period. The artifact does, however, also resemble some produced in the Missippian Period, 1200-1700 AD in Tennessee.

Whatever the temporal and cultural origins of that artifact, the region was inhabited during the millennia it took for the inundation of the Chesapeake Bay and tributaries to reach current high water marks. Initially rapid, at least in geological terms, it took about 8,000 years for sea level to stabilize near current levels, although it continued to rise, and in recent decades is again accelerating. Submerged terrestrial sites would most likely date from the Clovis period, 12,500 years before the present, through the Late Archaic Period, around 4000 years ago. Sites would be on inundated land forms like those found in dry land areas today, typically on level high ground, especially where near a body of water. Drowned river channels within the bay, also called paleo-channels, would be the focus of larger sites, particularly higher areas near bends or confluences. Sites away from expanses of open water during inundation that had low energy shorelines would be the most likely to survive inundation intact. Although submerged terrestrial prehistoric sites are not documented, much less tested or excavated, artifacts have frequently been reported by watermen and others from shoals, shallows, and shorelines (Blanton and Margolin 1994, Lowery 2001).

Shipwrecks abound in Virginia waters. The heavy reliance on waterborne transportation on the bay and its tributaries since the earliest colonial times is reflected in a large number of sunken vessels in the region. There are over 200 shipwreck sites recorded in the Virginia Department of Historic Resources data base.

No submerged archaeological sites are recorded in the Virginia Department of Historic Resources' Virginia Cultural Resource Information System (VCRIS) database for the lower Piankatank River. No shipwrecks or obstructions are recorded for this area in the NOAA Automated Wreck and Obstruction Information System, the closest are two miles east of Stingray Point, or about five miles from the project area. Reef areas identified for the project have characteristics suitable for the location of unidentified submerged terrestrial sites, possibly dating as late as the Late Archaic period; however the placement of reef materials should not result in adverse effects to any submerged sites that might exist. Fossil shell for the reef construction will be from dredge sites in the James River near Trimble Shoal which have been established by the Virginia Marine Resources Commission (Virginia Water Protection Individual Permit 2013-1115). Due to the previous dredging in this area, extant archaeological resources are unlikely; however, the dredging contract includes instruction to halt dredging if archaeological materials are encountered.

3.8 VISUAL, AESTHETIC AND RECREATION RESOURCES

3.8.1 Visual and Aesthetic Resources. The Chesapeake Bay's diverse landscape has long been revered for its scenic beauty. Landscape on Virginia's western shore is typical coastal plain dissected into three broad peninsulas by four tidal rivers: Potomac, Rappahannock, York, and James. Vegetation ranges from uplands dominated by oak and loblolly pine to bald cypress swamps and freshwater marshlands in the region's series of smaller tributaries.

Low topographic relief, irregular shoreline, and offshore islands characterize the eastern shore of Chesapeake Bay in Virginia and provide a unique aesthetic appeal. Areas of open water and extensive wetlands with tall marsh grasses, shrubs, and trees characterize much of the middle and lower eastern shore. Hummock-and-hollow microtopography (upland mounds surrounded by lowlands) is predominant in the near-shore habitats in this region.

In addition to the Chesapeake's natural beauty, the traditional waterfront communities are of particular aesthetic value. The historic watermen's communities along the Chesapeake's western and eastern shores offer an aesthetic charm and have contributed greatly to tourist-based industries in these areas. Traditional Virginia workboats operating in these areas bring aesthetic appeal to the region as well as cultural value. Some shellfish-related activities, such as certain types of aquaculture, have the potential to create conflicts with shoreline residents, as has been evident in Virginia's coastal bays in recent years. Homeowners have objected to in-water structures that alter their scenic views and to the noise of workboats.

3.8.2 Fishing. Chesapeake Bay supports a significant recreational fishery. Approximately 1 million resident and non-resident anglers fished a total of 14.5 million days of fishing in Virginia during 2001 (USDOI 2001). The principal species of fish sought throughout the Bay include striped bass, black sea bass, bluefish, channel catfish (*Ictalurus punctatus*), white catfish (*Ictalaurus catus*), winter flounder (*Pleuronectes americanus*), summer flounder, spotted sea trout (*Cynoscion nebulosus*), weakfish (*Cynoscion regalis*), Spanish mackerel, croaker (*Micropogon undulatus*), white perch (*Pomoxis annularis*), yellow perch, and spot. Many recreational fishers specifically target striped bass. The striped bass stock of Chesapeake Bay is one of four east coast migratory stocks (i.e., Roanoke, Delaware, and Hudson rivers) and contains premigratory juveniles and transient adult populations that immigrate to waters in Virginia during the spring spawning season. Recently, the striped bass seasons in Virginia have opened in May, closed in June, and reopened from October to December. Red drum (*Sciaenops ocellata*) and black drum (*Pogonias cromis*), which migrate into Tangier Sound and the lower Bay during the spring, are highly sought by recreational fishers. Fishing for various target species may occur throughout the year, according to State regulations; however, productive fishing for each species varies seasonally. Additionally, recreational fishing for blue crab is a popular near-shore activity throughout the Bay from May through mid-October, peaking during the summer months. Largemouth bass (*Micropterus Salmoides*) and crappies (*Pomoxis nigromaculatus*) are common catches in freshwater tributaries There is no recreational oystering in the Bay, although many owners of shoreline property participate in oyster-rearing programs coordinated by the Chesapeake Bay Foundation.

3.8.3 Boating and Navigation. Boating on Chesapeake Bay is a popular recreational activity and an important component of the economy of Virginia. In 2002, 243,590 boats were registered in Virginia. Nationally, Virginia ranks 19th in the nation for the number of registered boats. Trailered powerboats represent most of these licenses, followed by in-water powerboats, and sailboats. Oyster bars currently present in the Bay have low profiles; therefore, they pose no greater threat to navigation of recreational vessels than any other kind of bottom in the Bay.

3.8.4 Waterfowl Hunting. Waterfowl hunting is a popular sporting tradition in near-shore areas throughout Chesapeake Bay. The Delmarva Peninsula is an important resting and wintering ground for many species of migratory waterfowl and other birds during winter months. Canada geese (*Branta canadensis*) are by far the most sought after waterfowl species hunted on Maryland and Virginia's Eastern Shore. Puddle ducks such as mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), and teal (*Anas spp.*) are major target species for Bay-area hunters in Virginia. Sea ducks and diving ducks, including surf scoter (*Melanitta perspicillata*), white-winged scoter (*Melanitta fusca*), black scoter (*Melanitta nigra*), long-tailed duck (*Clangula hyemalis*), and canvasback (*Aythya valisineria*), are among the principal game species sought in open waters of Chesapeake Bay. Many outfitters advertise waterfowl guiding on Virginia's western and eastern shores.

Most waterfowl hunting is conducted from shore blinds constructed above the mean high-water line or from field blinds. Offshore hunting for diving ducks and sea ducks takes place predominantly from specialized gunning boats anchored in open waters, although wading on the natural bottom is permitted in some locations. Virginia regulations establish an offshore hunting zone as being 800 yards from any shoreline. The hunting zone includes Chesapeake Bay proper and all tributaries up to the first highway bridge

3.8.5 Swimming. Recreational swimming is a popular summertime activity in the Chesapeake Bay region. Virginia offers several public beaches along the Potomac River and at numerous public access points along Chesapeake Bay. Several areas, including Hilton Beach, Huntington Beach, Buckroe Beach, Ocean View, Willoughby, and First Landing State Park are popular swimming destinations.

3.8.6 Wildlife Viewing. Wildlife viewing is a popular activity in the forests, marshes, and waterways of the Chesapeake Bay area. The eastern shore of Virginia is an important stopover for migratory shorebirds and like Maryland is another nationally recognized area for wildlife viewing. The State established the Virginia Bird and Wildlife Trail system to promote access to wildlife viewing. This system consists of 18 trails in the Chesapeake Bay region with loops ranging along the shorelines of the western peninsulas to the eastern shore.

3.9 PUBLIC SAFETY

Public safety factors in and around Chesapeake Bay include such activities as emergency services, law enforcement, and fire protection. No information suggests that the current oyster population or the oyster fishery have caused any significant demand for public safety services. Public safety issues related to recreational boating have arisen in recent years as a result of using construction debris to create new artificial reefs. In 2007, the Mary Jo Garreis Memorial Reef, which was projected to support up to 4 million oysters, was constructed at the mouth of the Magothy River in Maryland. It was placed in a location that was too shallow, creating a potential boating hazard. Although no actual boating accidents related to the reef were reported, the reef material was removed in response to complaints from members of the public. Potential effects on boating are considered in selecting sites for artificial three-dimensional reefs in Virginia.

3.10 COMMERCIAL NAVIGATION

The Piankatank River lies in a rural area with no large-scale commercial activity or ports to support it. Small scale commercial activity in the area is typically oyster, blue crab or finfish related and the vessels used for such operations are typically small (<50 feet in length) and privately owned. There are no maintained federal navigation channels in the local area, the nearest lie in the Bay main stem miles from the proposed project.

Oyster reefs, whether developed naturally or created artificially, could become navigation hazards for shallow-draft commercial vessels transiting small inlets and tributaries in the Bay. Aquaculture facilities and activities that are elements of several of the alternatives also could pose navigation hazards. In addition, commercial vessels that release or take on ballast water could serve as vectors for dispersing the Suminoe oyster (*Crassostrea ariakensis*), a non-native species, into regions other than Chesapeake Bay.

4.0 ENVIRONMENTAL EFFECTS

This section is the scientific and analytic basis for the comparisons of the project alternatives. See Table 1 in Section 2.0: Alternatives, for a summary of impacts. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects.

4.1 GENERAL ENVIRONMENTAL EFFECTS

4.1.1 Physical Setting. An increase in the oyster population of the Piankatank River may counter some of the cumulative effects of watershed development and pollutant loading in the river; however, the project is not expected to result in significant changes the physical setting of the project area.

Under the NAA, no impacts, either positive or negative, are expected to occur with respect to the physical setting.

4.1.2 Hydrology. The construction of new oyster reefs may result in small changes to specific element of the hydrology adjacent to project area. The project is not expected to affect the hydrologic cycle, flooding, the inflow for freshwater into the system, tides, or ground water. New reefs will affect small changes in the movement of water in and around the reefs. If new reefs are located close to shore, they may affect the rates of erosion and sedimentation by reducing the amount of wave energy that hits the shoreline behind the reefs.

The NAA is not expected to have any effect on the hydrology of the project area.

4.1.3 Water Quality. The PA could result in adverse impact to water quality that is predicted to be temporary and localized. Impacts may include an increase in turbidity and TSS. Increases in turbidity and TSS would be due to fine material included in the construction materials, as well as the suspension of bottom sediment at the placement site. Construction materials would be inspected and fine material would be removed prior to construction to ensure that excess amounts of fine material would not be introduced into the water column. TSS and turbidity levels are predicted to return to normal once construction activities have been completed. Increased turbidity and TSS levels also have the potential to lower the DO concentration in the water column. Reduced dissolved oxygen levels within the water column can stress aquatic organisms if the levels are low enough.

The PA is also expected to have positive impacts on water quality in the Piankatank River that would last throughout the 50 year lifespan of the project. Once constructed, the new reefs would stabilize the river bottom, which could lower TSS and turbidity levels. Additionally, oyster reefs will provide attachment sites for sessile filter feeders such as mussels and oysters. These organisms can remove substantial quantities of suspended material from the water column as they feed. For example, a single oyster is reported as being able to filter up to 60 gallons of water a day. These animals remove suspended solids from the water column, decreasing turbidity, reducing TSS levels, and increasing water clarity.

The NAA would not change the existing water quality conditions.

4.1.4 Climate Change. Implementation of the PA is not expected to have any negative impacts on ongoing climate change, including the rise of relative water levels in tidal, estuarine waters, increases in temperatures, and increased acidity of local waters. Locally, if the proposed reefs are built, oysters growing on them will begin to sequester carbon in their shells, as well as consume phytoplankton that is produced at higher rates due to higher levels of carbon in waters due to atmospheric CO_2 (derived from fossil fuel burning) absorption by salt water. Local oyster reefs may provide a buffer against increases in acidity, though the scale of the project is too small to have more than a minor, local impact. Oyster reefs on the bottom will grow vertically over time, as sea level rises. It is likely that healthy oyster reefs can grow at least as fast as sea level rises, likely faster. This will maintain the reefs in the shallower waters they are currently placed in, providing a minor benefit against local sea level rise in the Piankatank River.

Under the NAA, no impacts, either positive or negative, are expected to occur with respect to climate change.

4.2 ENVIRONMENTAL RESOURCES

4.2.1 Wildlife Resources.

4.2.1.1 Benthic Community.-.The construction of new oyster reefs may result in short term, adverse impacts to the benthic community which would be both minor and temporary. Benthic invertebrates could be buried during the placement of reef material, resulting in injury and death. In addition, benthic populations in areas adjoining the project sites may be adversely affected from decreases in water quality that will occur during construction; however, these impacts will only last through the construction phase and normal conditions will return once construction has been completed.

It is anticipated that losses to benthic populations at the reef sites will be replaced by an alternate benthic community favoring hard substrate and the reef habitat will result in increased diversity and biomass. Additionally, benthos have been found to increase in biomass along the edges of hard reef structures due to the preference of larger mollusks (hard clams in particular, as well as soft clams) for soft substrate bordering harder areas, in particular reef structure (Wells 1957). These areas provide a partial refuge from predators, encouraging clam settlement and survival. Colonization of the hard reef structures will begin immediately after construction has been completed. Species composition on areas not subject to restoration will likely not be affected; though it is expected that biomass per unit area in areas outside reef footprints will go up due to the construction of the reefs.

The long term impacts of the project will be overwhelmingly positive for the fauna of the lower Piankatank River. Increasing the amount of reef habitat in the Piankatank Basin will result in population increases in reef dependent species. The PA will benefit aquatic fauna by providing attachment surfaces for benthic egg masses produced by mollusks and fish and for sessile organisms. Reef habitat will also provide shelter for fish and mobile invertebrates. It will take approximately three years for a mature community to become established on the reef habitat (Burke 2010). The project may increase the populations of recreationally and commercially valuable finfish and shellfish communities. Additionally the PA may result in improvements to water quality resulting from increased oyster (and other filter feeders) populations, which will positively impact wildlife within the project area (Kellogg et al 2013).

The NAA will have no significant impacts on the benthic community of the Piankatank River.

4.2.1.2 Pelagic Community - The construction of the Piankatank project may result in potential short-term, negative impacts to fish populations in the project area. These impacts include injuries and mortality due to direct encounters during placement of reef material, disruption of normal behaviors, and a temporary decrease in water quality. Fish and other marine fauna could be injured during the placement of reef material. Fish, however, are extremely motile and are expected move out of the area during construction. Injury or death to slower moving animals may result if the organisms are buried under the reefs or if the organisms cannot move away from the project site when heavy equipment is being operated. Natural behaviors such as foraging and hunting may be interrupted while construction activities occur. Organisms that are able to leave the immediate area may be scared away from the affected sites, but behaviors should return to normal once the construction phase has been completed.

Construction of reef habitat may result in a temporary decrease in water quality; specifically, turbidity and the concentration of suspended solids and dissolved nutrients may increase while dissolved oxygen levels and water clarity may decrease. These changes could impact fish by interfering with the respiration of organisms with gills and predators which hunt by sight. Water quality will quickly return to pre-project levels once construction has been completed.

Long term impacts of the PA on fish populations are similar to the ones describe for the benthic community. The transitions of soft bottom habitat to hard reef habitat would result in population increases for reef dependent species and the entire reef community. The transitions of soft bottom habitat to reef may cause a decline in populations that rely on soft habitat at the construction sites. Although this project is not expected to cause significant changes to the overall populations of species reliant on open bottom because significant amount of that habitat type will remain available in the lower Piankatank River. Additionally, improvements to water quality resulting from increased filter feeding populations will positively impact fish within the area.

No changes to the pelagic community that live within the project area are expected to result from the NAA.

4.2.1.3 Rare, Threatened, and Endangered Species - A search of the VDGIF Fish and Wildlife Service database reveals that a number of federally listed threatened or endangered species, as well as state species of concern can potentially be found in the project area (Table 2). The effect the PA will have on these species will vary due to their preferred habitat and life cycle.

A number of the RTE species are terrestrial and have no association with the project area; therefore the PA will have no impact on these species. These species include the eastern tiger salamander, the peregrine falcon, the upland sandpiper, the loggerhead shrike, Henslow's sparrow, Mabee's salamander, the barking treefrog, the northern long-eared bat, the Diana fritillary, the spotted turtle and the migrant loggerhead shrike.

Some RTE species are associated with shoreline habitat. Although this habitat type is located near the project area, it will not be affected by the construction of the PA. These species include the Northeastern beach tiger beetle, piping plover, black rail and red knot. The piping plover and Northeastern beach tiger beetle, both state and federally threatened, are associated with sandy beaches and do not utilize habitat types found at the proposed project sites. There are no recent records of the tiger beetle from the Piankatank River shorelines. The Red Knot, a federally proposed species, is a transient species which is known to fly through the project area in order to reach the species' major North Atlantic staging areas located in the Delaware Bay and Cape May Peninsula. They are not typically found in the Piankatank River region. The state endangered black rail, a small wading shorebird, could be found foraging along the shoreline, wetlands and riparian scrub-shrub habitat along the Piankatank River. It is not typically found in deep water habitat. No significant negative impacts are expected to be caused to these species by the construction of the PA.

The northern diamond-backed terrapin, a collection concern species, is also associated with coastal habitats, living within Spartina marshes. They typically stay close to shore and are not known to be swim out to sea. However, there is a possibility that individual animals may be negatively affected during the construction of the PA. They may come in contact with the construction equipment or reef material during placement, which could result in injury or death. Construction of the project may disrupt the turtles' natural behaviors and cause them to leave the project area. Impacts to the terrapins will be eliminated once construction had stopped.

Bald eagles, a federal species of concern, are found along coastlines, rivers and marshes. The closest know eagle nest is located approximately 0.5 miles from the project area and bald eagles are known to fish in the Piankatank River. Construction of the PA may negatively affect local eagles by disrupting their natural foraging behaviors and cause them to temporarily leave the area. It is expected that any disruptions caused by the construction of the project will end as soon as construction activities are completed.

The remaining species, shortnose sturgeon (Federally and state endangered), Atlantic sturgeon (Federally and state endangered), Kemp's ridley sea turtle (Federally and state endangered), leatherback sea turtle (Federally and state endangered), loggerhead sea turtle (Federally and state threatened), green sea turtle (Federally and state threatened), alewife (Federal candidate) and the bluback herring (Federal candidate) are all aquatic species.

Sea turtles would be rare and transient in the local project area. Sea turtles preferentially utilize the saltier waters of lower Chesapeake Bay and the Seaside Eastern Shore and few sea turtles can be found in the Piankatank River. Leatherback turtles prefer pelagic habitat and prey species (jellyfish) that are not typically found in the project area. Green sea turtles typically feed within SAV beds, as this species is primarily an herbivore once the animals become older juvenile or adult, which are the life phases potentially found in Chesapeake Bay. These turtles are quite rare in Chesapeake Bay, being typically found in greater numbers further south, where waters are warmer and SAV beds more common and larger. Since construction will take place outside any SAV beds, it is highly unlikely that a green turtle will be in the proposed project area. The loggerhead sea turtle is the most common sea turtle found in the Chesapeake Bay region and there is a chance foraging adult or juvenile loggerhead turtles will be found in the local project area. Due to the noise and disturbance associated with the construction equipment, it is likely that any visiting sea turtle will vacate the local area and forage elsewhere. Individual animals may be injured or kill by impacts with barges used to transport reef building material.Overall, no significant negative impacts are expected for the sea turtle species as a result of project implementation.

The shortnose sturgeon is very rare locally, with only several dozen records of capture from the Chesapeake Bay region in the past century; 40 of which were the result of a reward program for reporting capture between 1996 and 2000 (Welsh et al 2002). Most of these records are from Maryland waters, and none from the Piankatank River, with the closest record (a single capture) from the mouth of the Rappahannock River. Individual fish may be injured or kill by impacts with barges used to transport reef building material or during the placement of material. The project is not likely to adversely affect this species as a result of project construction.

The Atlantic sturgeon is also quite rare locally. However, it does have a small breeding population in the James River (Musick 2005) that appears to be slowly growing, and there are active efforts to increase this species numbers in the State. There is no known population of this species, breeding or otherwise, in the Piankatank River, though it is likely that historically there was. Recent capture records (Welsh et al. 2002) did not record any Atlantic sturgeon from the Piankatank River. Individual animals may be injured or kill by impacts with barges used to transport reef building material or during the placement of material. Due to the rarity of the sturgeon in the project area, it is determined that the project is not likely to adversely affect the Atlantic sturgeon.

The two anadromous herrings, the alewife and blueback herring were once very abundant in the Chesapeake Bay but, due to habitat modification (the damming of rivers that lead to spawning habitat), coupled with overfishing, populations of both species have dropped significantly. Both species may have spawned in the upper reaches of the Piankatank River, in its non-tidal freshwaters. Due to the location of the proposed oyster reefs in the more saline lower reach of the Piankatank River, construction of the selected alternative is not likely to adversely affect either species.

The NAA would have no effect on rare, threatened or endangered species found in the project area.

4.2.1.4 Invasive Species - Most invasive species in the Chesapeake Bay region will not be impacted, either positively (decreased in number) or negatively (increased in number) by implementation of the PA. Invasive species that may be affected by the construction of the PA include common reed, and the marine whelk (*Rapa venosa*). If nearshore fringing oyster reefs are constructed, local native vegetation would colonize the shallows as additional sediments accrete in the lee of the reefs. This would result in an expansion of native vegetation, possibly at the expense of nearshore stands of the invasive common reed; which can be viewed as a positive impact.

The marine whelk, *Rapa venosa* originated from the Sea of Japan in the south Pacific and can now be found in the Chesapeake Bay. This animal eats mollusks, including clams and oysters, and prefers hard substrate, such as stone or oyster reefs, to lay its egg cases on. Currently, this organism is only found south of the Piankatank River.

The only other aquatic invasive species of concern is the Chinese mitten crab, *Eriocheir sinensis*, which has been found in Chesapeake Bay but has not been documented in the Piankatank River nor has it been documented to reproduce in the Bay as yet. No impacts to Chinese mitten crabs are expected due to project implementation, since even if present, it generally prefers fresher waters and its lifestyle is to burrow into shoreline sediments to make its burrows, rather than an open water or reef dweller.

Under the NAA, no impacts, either positive or negative, to invasive species are expected.

4.2.2 Habitat Resource.

4.2.2.1 Oyster Resources – Oysters that currently inhabit the project area may experience the short term impacts that were described in Section 4.2.1.1, which detail the effects on the benthic community. These include impacts due to the temporary decrease in water quality, and injury and mortality resulting from construction activities. Alternative substrate will not be placed on existing reefs or sites that have remnant reefs; therefore natural shell resources would not be buried.

The long term goal of the proposed project is to improve the oyster resources of the Piankatank River. If the PA has been implemented, the acreage of available reef habitat would be increased. These changes would result in the increase oyster populations, in addition to supporting a diverse community of reef dependent species. This project is expected to have significant beneficial impacts on the oyster resources within the project area, which will last over the 50 year life span of the project.

4.2.2.2 Essential Fish Habitat - The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act require Federal action agencies to consult with the NMFS regarding the potential effects of their actions on EFH, which is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (NMFS, 1998).

Description of Proposed Action **–** The preferred Alternative is Alternative B which is described in Section 2.1.2 of this document.

Analysis of the Effects **–** An EFH Assessment, which includes full descriptions of seventeen fish species that occur within the project area, is included in Appendix C.

Impacts of the proposed project to EFH fish species can be divided into two categories, direct and indirect. Direct impacts are defined as those “which are caused by the action and occur at the same time and place." While indirect impacts are those that may be caused by the project, but would occur in the future or outside of the project area.

Direct Effects - Finfish could be directly affected by construction of the project either by being struck by the dredging vessels or by being struck by material (either shell or alternative substrate) as it is being placed. Individual animals could be injured or killed through contact with the construction equipment or could be smothered under the reef material.

Construction of the project could result in temporary, minor changes to water quality which may adversely affect EFH species. The disturbance of sediment and placement of reef material is expected to result in increased turbidity and decreased dissolved oxygen content, during the placement of material. Increased turbidity could cause gill clogging and reduce the foraging success of sight hunters. Reduced dissolved oxygen levels within the water column can stress aquatic organisms if the levels are low enough. Impairments to water quality are expected to be minor and temporary, during the placement of reef material.

A long term, direct effect that will result from the construction of reef habitat is the alteration of sandy bottom habitat to hard reef structure. Currently, the Piankatank system mainly consists of open sandy or muddy bottom habitat. The uniform bottom type is a remnant of the mismanagement and eventual collapse of the oyster fishery, as almost all of the hard reef structure that was originally present in the system has been lost. Baylor mapped oyster reef habitat in Virginia in 1894 (Baylor 1894). This survey found 7097 acres of oyster reefs in the Piankatank; while today there are less than 200 acres. This project represents an effort to restore a small fraction of the reef structure to the system. Although some of the preferred habitat type of the sand bar shark that is present within the mouth of the Piankatank River will be altered, large areas of sandy bottom will remain available and the structure added to the system will benefit other EFH species.

In addition to increasing habitat heterogeneity, the new reef structures will produce other long-term benefits. The reef will increase productivity of the system and provide habitat for prey species, such as crustaceans, mollusks, worms and fish. The hard reef structures will provide attachment surfaces for sessile organisms, cover and shelter for many species of fish and other motile invertebrates such as crabs and shrimp, and attachment surfaces for benthic egg masses. Additionally, it is predicted that the reefs will be utilized by oysters, mussels, and other filter feeding organisms, resulting in improved water quality.

Indirect Effects - A number of indirect effects may result from the construction of the proposed project. The placement of reef material may reduce the population of prey species used by EFH species. Relatively non-motile benthos, such as polychaetes and mollusks, will be destroyed at the reef sites; this may cause fish to move out of the project area for foraging until benthic communities recover. Recovery time of the benthos within project area is expected to be between several months to a number of years.

A final indirect impact to finfish that inhabit the project area is that construction activities may result in changes to fish behavior. The presence of large equipment may temporarily cause animals to stop normal behaviors, such as hunting and foraging, and cause these animals to leave the project area.

Sandbar shark HAPC - The sandbar shark (*Charcharinus plumbeus*), is designated as having a HAPC, which is described in regulations as a subset of EFH that is rare; particularly susceptible to human-induced degradation, especially ecologically important; or located in an environmentally-stressed area. It is predicted that construction of the project will result in an increase in turbidity and sedimentation associated with the placement of reef habitat, but the adverse effects of such changes will be minor, because they will be localized and temporary. Given their mobility, sharks can avoid turbidity plumes and, if necessary, survive short-term elevated turbidity. The proposed project will also result in the alteration of some of the preferred habitat type (sandy bottom) of the sand bar shark present within the mouth of the Piankatank River to hard reef habitat, large areas of sandy bottom will remain available and the structure added to the system will benefit other EFH species.

Department of the Army's Views Regarding the Effects of the Action on EFH **-** The significance of direct effects resulting from this project on EFH species will depend on life stage and the usage of the project area. For example, it is more likely that eggs and larval fish will be affected to a greater extent than adults and juveniles, because the older life stages have greater swimming abilities and will be able to move away from construction activities. However, eggs and larvae of many species are widely distributed over the continental shelf, so the destruction of these life stages is not expected to cause significant impacts to fish populations.

Direct adverse effects caused by changes in water quality are predicted to be minor and temporary in nature. Due to the relatively small amount of fine material that will make up the reef material (i.e. very little silt and fine material), increases in turbidity and decreases in dissolved oxygen are expected to be small and localized to the placement area. Once placement has been completed, water quality is expected to return to pre-project conditions almost immediately.

The transition of shallow, sandy bottom habitat to hard reef habitat will not be temporary in nature. However, the amount of sandy bottom habitat that will be altered is relatively minor. Large areas of sandy seafloor will remain available once this project has been completed. Heterogeneity of the aquatic habitat available in the Piankatank River will have lasting environmental benefits to EFH species and will far outweigh the effects that will result from the lost of sandy bottom habitat. The benthic and fish community will quickly colonize and unitize the newly constructed reef areas; while species that rely in sandy bottom habitat will move to unaltered areas adjacent to the project area.

Most indirect effects resulting from the project are expected to be minor and temporary. For example, it is expected that the benthic community in the project area will recover. Although there will be some loss of benthic animals at the construction site, it is unlikely that these losses will result in a significant change in the benthic community in the entire project area. Fish usage will return to pre-project conditions or better once construction has been completed.

USACE has determined that the construction of the proposed project may have minor adverse effects on EFH for Federally managed species, but the adverse effects on EFH species will largely be temporary and localized within the footprints of the constructed reefs. As discussed and evaluated in this EA and in the accompanying EFH Assessment, construction of oyster reefs is not expected to impact "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" to any appreciable extent over a significantly large area or over any significant period of time. Additionally, there is no reason to expect that EFH species would be concentrated in the project area. Although the construction of the project may impact individual fish, no adverse effects to the populations of EFH species that inhabit the Chesapeake Bay or the Piankatank River are expected. HAPC for the sandbar shark is not anticipated to be impacted by the project in any of the following ways: 1) the importance of its ecological function, 2) by human-induced or long-term degradation, 3) by stressing the habitat type, or 4) by compromising or jeopardizing the habitat, fully considering the rarity of habitat type. In conclusion, the project is not anticipated to cause adverse effect to EFH species or habitat (including HAPC) that may be in the project area.

Discussion of proposed mitigation – It is the opinion of USACE that no mitigation will be required for this project, because the project will not result in significant adverse effects on EFH for Federally managed species.

4.2.2.3 Submerged Aquatic Vegetation - In 2013 VIMS reported that there were 72.46 hectares of SAV within the Piankatank River, with persistent beds located along the inner edge of Cherry Point and Core's Creek, and intermittent SAV beds in many other areas. The two species of SAV found here are eelgrass, *Zostera marina*, and widgeongrass, *Ruppia maritima*. As of 2012, there are no SAV beds within 0.25 miles of the areas where construction is proposed. Additionally, historic SAV beds were eliminated from the pool of potential restoration sites; however the location of SAV beds is variable and can change from year to year. VIMS conducts annual SAV surveys in the Chesapeake Bay and survey data will be reviewed before construction to ensure that SAV beds are not damaged as a result of this project.

Although no construction will occur within SAV beds, there is the potential that SAV beds adjacent to construction sites will be adversely affected by changes in water quality. Decreases in water clarity would result from the disturbance of bottom sediment or from the addition of fine particulates included in the reef material. These impacts would be reduced by inspecting all of the construction material before it is placed in the Piankatank River to ensure that it is free of fine material and trash. It is predicted that increased turbidity would only occur in the area immediately adjacent to construction and would dissipate once construction has completed.

Indirect project impacts would benefit local SAV beds. Subtidal oyster reefs will stabilize bottom sediments, directly reducing TSS and increasing water clarity. Oysters' filter feeding could reduce TSS and phytoplankton in the water column, further improving water clarity. Oyster reefs can also provide protection to the nearby SAV bed against wave energy, boat wakes and storm surge, potentially allowing adjacent SAV beds to expand.

Negative impacts on SAV resources in the project area resulting from the implementation of the project are predicted to be minor and temporary.

The NAA would have no effect on SAV beds in the project area.

4.2.2.4 Wetlands – The project will have no impact on emergent wetlands. Construction of subtidal oyster reefs will result in the conversion of unconsolidated bottom wetlands, as identified by the NWI, to reef wetlands. The creation of new reefs may indirectly benefit adjacent subtidal wetlands, through improvements to water quality and increases to benthic and overall secondary production.

No significant negative impacts to wetlands are expected to be cause by the construction of the PA. All construction equipment will be staged from boats, as a result no access through or near emergent or intertidal wetlands will be necessary. Depending on the location of the reefs, minor to significant positive benefits to wetlands are expected by implementing the PA.

The NAA would have no effect on wetlands located within or adjacent to the project area.

4.3 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

There are no EPA Superfund sites in the Piankatank River or its watershed. There are no hazardous waste landfills in the region. The nearest solid waste management facility, a debris pile, is in Middlesex County, North of the Piankatank near the Rappahannock River, and does not appear to be connected to the Piankatank River watershed. Construction of reefs or the re-shelling of existing reefs would not be expected to result in the identification or disturbance of HTRW or solid waste. No releases of hazardous, toxic and radioactive waste will result from the implementation of the selected alternative.

The NAA would not be expected to result in the identification or disturbance of HTRW or solid waste.

4.4 AIR QUALITY

The PA would result in minor and temporary decreases of air quality while construction takes place. Increased air emissions would be associated with construction equipment, including a tugboat, cranes, front end loaders and other the diesel equipment used to place the reef material. Air emissions would include temporary increases in volatile organic compounds, nitrogen oxides, sulfur dioxide, and carbon monoxide. As the Piankatank River is located in an attainment area for all known air pollutants, calculations are not needed to estimate emissions of the six criteria pollutants. However, prior oyster restoration projects of similar magnitude have produced between 15 to 50 tons of criteria pollutants (volatile organic compounds, nitrogen oxides, sulfur dioxide, and carbon monoxide), based on the size of the project (less than 100 acres to approximately 300 acres in size), below the threshold level of 100 tons if the area was in non-attainment for any listed pollutant. No formal Clean Air Act conformity determination for the proposed project is required (9VAC5-160-30). The emissions produced during transportation and construction are not expected to exceed ambient air quality standards. No significant negative impacts as a result of implementing the PA are expected. Due to the sub-aqueous nature of the oyster reefs and their function in the ecosystem, no measurable positive impacts to local air quality are expected as a result of implementation of the PA.

The NAA would not be expected to result in changes to air quality in the project area.

4.5 NOISE

Under the PA, local noise levels will increase while construction activities are taking place. This increase will be due to the use of diesel engines on the various marine vessels (barges, tugs) and heavy equipment (front end loaders, cranes) used to construct the reefs. These vessels will all be operating offshore in rural areas. In total, the construction of reef habitat in the Piankatank River will take 8 months (4 months per year over 2 years). The equipment needed to place the reef materials includes a crane positioned on a barge, a tow boat to move the barge, and small vessels powered with outboard motors. Decibel levels produced by a crane are approximately 80 to 90 dBA, while a tugboat will produce approximately 80 dBA, and an outboard motor will create between 70 and 90 dBA.

The noise projections above describe the noise level at the source and do not take into account the factors that affect the noise levels experienced by a receptor. These include the distance from the source, obstacles that block noise such as barriers and buildings, topography, vegetation, and meteorological conditions such as wind direction and speed, temperature and temperature gradient, and humidity. Noise levels decrease as one moves further away from the source. Ambient noise levels will increase while restoration measures are being constructed and may be noticeable by the residents living adjacent to the Piankatank River. However, due to the distances from the construction sites to local residences, obstructions between the construction sites and residences, and the sound absorption qualities of buildings, sound levels due to construction will not be disruptive to residents. Construction will take place only during daylight hours to reduce disruption to people living on the shore of the Piankatank River.

Local, motile marine life will likely avoid the area where placement is taking place,due to the combination of water quality and noise impacts, but should return upon cessation of the construction activity.

The NAA will result in no significant impact on noise levels.

4.6 CULTURAL AND SOCIOECONOMIC ENVIRONMENT

No adverse effects to cultural resources are anticipated as a result of the implementation of this project. Effects to submerged archaeological resources are limited to the placement of materials on the seafloor. Should submerged archaeological resources exist in the reef building areas, effects of the undertaking would only be to bury them under the reef building materials which would not impact their integrity. In fact, the Advisory Council on Historic Preservation's Section 106 Archaeology Guidance suggests burying sites under fill as an alternative to data recovery to mitigate adverse effects of ground surface modifying projects (ACHP 2009:28). Terrestrial resources will not be impacted by the proposed project as construction will occur from the water, and on the seafloor. If unidentified properties are discovered during project implementation, the VDHR will be notified immediately.

The proposed project will not have a significant effect on the socio-economic resources of the area. No changes are expected in the area's population distribution, community cohesion, or land use as a result of the construction of the reefs and harvest areas. Positive economic impacts may be expected for local watermen due to the increase in the production of oyster larvae by the new sanctuary sites, which would be transported throughout the lower Piankatank River.

No impacts to cultural and socioeconomic resources would occur as a result of the NAA.

4.7 HISTORIC AND ARCHAEOLOGICAL RESOURCES

No impacts to cultural resources, either historic or archeological, are anticipated as a result of the implementation of the PA. Terrestrial resources will not be impacted by the proposed project as construction will occur from the water. Areas designated for proposed oyster habitat restoration have been disturbed by shellfish harvesting activities for well over a century. Therefore, it is unlikely that underwater resources that may have existed would have been disturbed to the extent as to lose their significance. A pre-construction hydroacoustic survey will be performed prior to project construction. If unidentified properties and/or artifacts are discovered during project implementation, which includes the pre-construction survey, the VDHR will be notified immediately.

No impacts to historic and archaeological resources would occur as a result of the NAA.

4.8 VISUAL, AESTHETIC AND RECREATION RESOURCES

No significant negative impacts to the visual, aesthetic and recreational resources will be caused by the proposed project. During construction, some may consider that visual and aesthetic resources are imparted due to the presence of the heavy construction equipment. These impairments will be temporary, as conditions will return to normal once construction has been completed. Recreation resources may also experience temporary, adverse impacts. During construction, private boats will not be allowed to enter placement areas due to public safety considerations. These restrictions may reduce recreational opportunities only during the construction phase.

Most long-term impacts on recreation resources resulting from implementation of the project are predicted to be positive. For example, recreational fishermen may find an increase in finfish numbers and species on and in the vicinity of the reefs. Additionally, water-related recreation will benefit from the increase in water quality resulting from the filtering ability of oysters. Construction will result in shallower depths over the new reefs, which may require that vessels with deeper drafts navigate around the project sites. Signs will be placed to warn boaters of the location of the new reefs.

No significant negative impacts are expected to visual, aesthetic or recreational resources as a result of implementation of the NAA.

4.9 PUBLIC SAFETY

During project construction, large vessels will be moving in and out of the Piankatank River and will be placing material at the restoration sites. Local boaters will be prohibited from entering the project area while material is being placed, to ensure public safety. Even with the additional navigation restrictions, local boat traffic would continue on the Piankatank River during construction, because reef construction would not take place in the deep channels typically used for local boater navigation.

To ensure long term public safety, reefs will be built at depths that will allow leisure crafts to pass over the reefs without damaging the vessels. In addition, the Coast Guard will be consulted. Aids to navigation, as recommended by the Coast Guard, will be included in project design as needed to warn boaters of the submerged reefs. Aids will be furnished by VMRC.

No negative impacts on public safety, short or long term, are expected as a result of construction of the reefs proposed in the PA or the NAA.

4.10 COMMERCIAL NAVIGATION

During project construction, various larger vessels, including barges and tugs, will move about the Piankatank River. Fishermen, if in the area while construction is occurring, can easily avoid construction vessels and these vessels will not be working in any active oyster fishing grounds. Post construction, all constructed reefs will be well below mean low water and will not be a hazard to navigation. Signage would be installed, as recommended by the Coast Guard, to inform local boaters where the borders of such reefs are so that they can be avoided. Required signage will not be located within any local navigation channel, either maintained or natural. No significant negative impacts to commercial navigation are expected, either during or post-construction.

No negative impacts on commercial navigation are expected as a result of construction of the NAA.

4.11 CUMULATIVE IMPACTS

The cumulative impact assessment is the evaluation of the effects that other past, present, or reasonably foreseeable future actions, alternatives, or plans might have on the environment when considered along with the proposed project's impacts. Cumulative impacts can either be additive or interactive. Additive impacts are those that can collectively have a profound effect on the given resource due to the collective magnitude of the effect. Interactive impacts are impacts that accrue as a result of assorted similar or dissimilar actions, alternatives, or plans that tend to have similar effects, relevant to the resource in questions.

4.11.1 Past Actions. Past actions occurring within the Piankatank River system that have affected oyster population and habitat include the historical harvesting of oysters, which impacted the population to an increasing degree as native populations could no longer keep up with increased mortality from disease and overharvesting on a regional scale. The nature of oyster harvesting results in the destruction of the 3-D reef structures; therefore, habitat destruction has occurred on a wide scale throughout the Piankatank system. Also, oysters and other habitat components have been negatively affected by increased sedimentation from stormwater runoff, as the watershed has become rapidly developed, and the shoreline has been hardened, with a loss of wetland buffers. These conditions all impact the ultimate success of the project. Past actions intending to have a positive impact on oysters in the Piankatank River include the restoration, through seeding, and construction of several reefs in the system.

4.11.2 Present and Reasonably Foreseeable Future Actions. This project is part of a larger project being implemented bay-wide by the Commonwealth of Virginia; State of Maryland; Norfolk District, USACE; and Baltimore District, USACE, in order to meet the goals of Executive Order (EO) 13508, Chesapeake Bay Protection and Restoration. The goal is to restore oysters to 20 tributaries of Chesapeake Bay by 2025, with half the tributaries in Maryland and the other half in Virginia. This goal was ultimately reduced to 10 tributaries. The Piankatank has been selected by the USACE Native Oyster Restoration Master Plan (NORMP) as a priority tributary for large-scale restoration. The USACE master plan (2011) set the recovery goal for the Piankatank River of between 700 and 1000 acres of healthy oyster reefs. The proposed project will help achieve the goal in EO 13508, though this project is too small to fully restore the Piankatank River, it will be an important step towards doing so.

Impacts that would be of a cumulative nature include the conversion of soft to hard bottom habitat as well as the impact on resident benthic communities. While species composition of the benthic community may change, productivity of the area is anticipated to increase significantly. The 3-D nature of a layer of oyster cultch provides niches or refuges that may not otherwise be available. Overall, the impacts represent a restoration of historical conditions.

A reasonably foreseeable future action that will take place in the Piankatank River is the continuation of the re-shelling program managed by VMRC. As their budget allows, VMRC adds oyster shell to seed areas, which are areas where waterman and agencies are allowed to remove spat on shell from the site and place them in other tributaries of the Chesapeake Bay. These sites serve to jumpstart the oyster spat production through enhanced recruitment in areas where recruitment is currently low and would produce much-needed disease-resistant native seed for relocation to other estuaries where populations are low. The goal of the re-shelling program is specifically for harvest management and not ecosystem restoration.

Other actions likely to continue is the harvest of oysters by commercial fishermen from designated public oyster grounds, as managed by the state and the harvest of oysters from privately leased oyster grounds. The proposed project is likely to enhance oyster recruitment in the Piankatank River, which would increase local harvests and perhaps aid in habitat maintenance, as oysters build their own habitat out of their shells.

4.11.3 Mitigation. Several measures have been incorporated into project design and implementation to avoid and to minimize impacts or potential impacts. These include the construction of the project from the water by barge, which eliminates the need for staging areas near the river. Coordination with the VDGIF, VDCR, and USFWS regarding bald eagles will result in avoidance or minimizing disturbance during nesting season. Additionally, the project design will include the placement of signs, as advised by the U.S. Coast Guard, warning boaters of the location of the newly constructed reefs.

No mitigation is anticipated for the construction of the PA.

4.12 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

The PA is compatible with federal objectives, and will likely aid in state and local objectives. The primary federal objective with respect to oysters is to restore them successfully to 20 tributaries of Chesapeake Bay by 2025, and the PA has been designed to help reach this goal. At the state and local level, the priority is increasing the commercial harvest from the public oyster grounds. The proposed project, while not permitting direct harvest on the restored reefs, will enhance recruitment via increased planktonic larval production by the oysters on the restored reefs. This will help stabilize and enhance the overall population of oysters in the river, providing direct benefit to commercial fishermen.

4.13 CONFLICTS AND CONTROVERSY

There is ongoing controversy regarding sanctuary oyster reefs in the state of Virginia. Much of this is due to misperceptions on the part of commercial oyster interests, who often protest such projects. The proposed project will not negatively impact public oyster grounds but will instead enhance the productivity of nearby harvestable oyster grounds. Private leases will benefit from enhanced oyster recruitment due to the increased oyster larval production from the proposed sanctuary reefs and shelling of seed reefs and existing oyster reefs. Overall benefits to the commercial fishing industry are positive. Better communicating this information to seafood industry interests is proposed, as well as increased coordination with state and local interests as the proposed project moves towards construction.

4.14 UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

Oyster restoration in the Piankatank River, as with the entire Chesapeake Bay, faces certain risks that must be acknowledged. These risks include the ongoing, though lessening, impacts from disease in some areas, increased predation from cow-nose rays, impacts due to climate change and poaching. Some risk can be reduced through project design. Other risk cannot be altered, but has to be acknowledged.

The climate change impacts thus far have been limited, though if oceanic pH continues to decrease, this condition may render oysters, particularly larvae, less able to form shells, which will decrease larval and adult survival rates. Climate change may alter phytoplankton bloom times as water temperatures increase. A timing mismatch between oyster reproduction and spring phytoplankton blooms could result in reduced availability of food for oysters. Climate change may also increase the virulence of diseases affecting oysters if winter water temperatures increase. Little can be done locally regarding climate change impacts, though it is expected that oysters will be able to at least partially adapt to changing climate conditions such that they maintain a presence in Chesapeake Bay. It is expected that the growing season for oysters will lengthen as winter waters grow warmer, allowing oysters to achieve a refuge size against predation and perhaps form cohesive reefs faster than they can at present.

Another risk associated with oyster restoration is the possibility that newly created habitat may be poached. Poaching damages reefs and reduces oyster populations, reducing the effectiveness of the restoration effort. The risk of poaching on the newly created reefs will be reduced because they will be constructed out of alternative materials, such as larger concrete, granite or limestone marl pieces, which makes poaching more difficult. Additionally, VMRC, the state agency tasked with enforcing anti-poaching laws, recognizes the imperative to control poaching within the commonwealth and has recently increased efforts to address this problem.

Due to reduced predation from coastal shark species, cow-nose ray populations have increased and have the potential to impact restored native oyster reefs from their predation of oysters.. The use of alternative reef substrate will discourage cow-nose ray predation because rays are best able to feed on loose oysters, not oysters fixed firmly to a natural shell reef or large piece of stony material. If improved fishery management leads to a recovery of shark species that formerly kept cow-nose ray populations in check, the ray may become reduced in numbers and the threat it currently is could be substantially reduced.

Disease impacts, that in the 1980s reduced already low oyster populations by an additional 90%, remain a threat, though it is diminishing. One of the best ways to increase the rate of disease resistance development is to set aside large areas as oyster sanctuaries where natural selection can take place. Since disease typically impacts younger age classes of oysters (1-3), oysters in older age classes often possess significant resistance. These are the large oysters typically targeted by the oyster fishery, so allowing them to persist and reproduce in a sanctuary allows for them to increase their numbers over time relative to oysters that do not possess this capability. Ultimately, with aid from such sanctuaries, oysters may develop enough resistance such that disease is no longer a major threat, and the proposed project will aid in this.

4.15 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

1. Anadromous Fish Conservation Act of 1965, as amended

Compliance: Anadromous fish species would not be affected. The project has been coordinated with the NMFS and is in compliance with the act.

2. Archaeological and Historic Preservation Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: The Virginia Department of Historic Resources (VDHR) has been coordinated with concerning historic and archaeological resources in the project area, and agreed that there was no potential for the project to cause effects to archaeological resources.

3. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Submission of this report to the Regional Administrator of the USEPA for review pursuant to Sections 176 (c) and 309 of the Clean Air Act signifies compliance. The project area is located in the Northeastern Virginia Intrastate Air Quality Control Region (Chapter 20, Section 200), which is in attainment for all criteria pollutants; therefore an estimate of emissions is not required. Although there will be minor, temporary air pollution increases from construction equipment, these increases will be short-term and below *de minimis* levels. No impacts to air quality will result from the project; therefore no permits would be required for this project.

4. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972 and Water Quality Act of 1987) PL 100-4, 33 U.S.C. 1251 et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review has been incorporated into this report. A VMRC permit would be acquired via Virginia's joint permit application (JPA) process. State Water Quality Certification under Section 401 of the Clean Water Act, as amended, would be obtained from Virginia DEQ prior to construction.

5. Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

Compliance: There are no designated coastal barrier resources in the project area that would be affected by this project.

6. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.

Compliance: In accordance with the Coastal Zone Management Act (CZMA) and the approved Coastal Zone Management Program of Virginia, the proposed project has been evaluated for consistency with the coastal development policies. A consistency determination will be submitted to VDEQ.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: The online project review process required by the U.S. Fish and Wildlife Service has been completed and submitted to the agency to begin the coordination process. The project review package is included in Appendix F. Coordination has also begun with NOAA. This document will be sent to the USFWS and National Oceanic and Atmospheric Administration (NOAA) for review. The comments received from both agencies will be incorporated into the project design and this document. The correspondence with the Agency will included in Appendix G and responses to the comments provided are included in Appendix H.

8. Estuarine Protection Act, 16 U.S.C. 1221 et seq.

Compliance: Not Applicable. No designated estuary would be affected by project activities.

9. Farmland Protection Policy Act of 1981

Compliance: No prime or unique farmland would be impacted by implementation of this project. This act is not applicable.

10. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Coordination with the National Park Service and the VDCR, relative to the

Federal and state comprehensive outdoor recreation plans, will signify compliance with this act. Pertinent correspondence will be added to in Appendix E once coordination has been completed.

11. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the USFWS signifies compliance with this act. Coordination with the USFWS is ongoing. The correspondence with these agencies is included in Appendix G and responses to the comments provided are included in Appendix H.

12. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Coordination is not required because the proposed project does not involve an undertaking that will or may affect properties of facilities acquired or developed with the assistance from this Act.

13. Magnuson – Stevens Fishery Conservation Act also known as the Fishery Conservation and Management Act of 1976

Compliance: This act has been fully described in Sections 3.2.2.1 and 4.2.2.2 of this document. The EFH Assessment for this project can be found in Appendix D and coordination with the NOAA will be included in Appendix G after coordination has been completed.

14. Marine Mammal Protection Act of 1972, as amended

Compliance: This project will not impact marine mammals (i.e., no "take" meaning harm, harass, injure, or kill), because it is extremely unlikely that marine mammals will be found in the project site and none of the activities needed for construction have been found to affect the behavior of marine mammals. Coordination with NOAA will be completed prior to the signing of the FONSI.

15. Marine Protection, Research and Sanctuaries Act of 1988, as amended

Compliance: The term "dumping" as defined in the Act (3[33 U.S.C. 1402](f)) does not apply to the placement of material for a purpose other than disposal (i.e. placement of rock material as an artificial reef or the construction of artificial reefs as mitigation). Therefore, the Marine Protection, Research and Sanctuaries Act does not apply to this project. The disposal activities addressed in this have been evaluated under Section 404 of the Clean Water Act.

16. Migratory Bird Treaty Act and Migratory Bird Conservation Act

Compliance: No migratory birds would be affected by project activities.

17. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 432 et seq.

Compliance: Preparation of this report, public coordination and addressing public comment signify partial compliance with NEPA. Full compliance is noted with the signing and issuing of the Finding of No Significant Impact (FONSI).

18. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.
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Compliance: In consultation with representatives of the State Historic Preservation Officer it was determined that the project has no potential to cause effects to historic properties. Preparation of the Draft EA and public coordination and comment signifies partial compliance with National Historic Preservation Act. Full compliance is noted with the signing and issuing of the FONSI.

19. Resource Conservation and Recovery Act. 42 U.S.C 6901 et seq (1979)

Compliance: No hazardous substances have been definitively identified in the project area. The project is in compliance with this act following state and Federal agency concurrence with the findings of the Draft EA.

20. Rivers and Harbors Appropriation Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: The proposed work would not obstruct navigable waters of the U.S.

21. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Compliance: No requirements for USACE activities.

22. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Compliance: The Piankatank River has not been designated as a national wild and scenic river and it is not part of Virginia's Scenic Rivers Program.

Executive Orders

1. Executive Order 11988, Floodplain Management, 24 May 1977, as amended by Executive Order 12148, 20 July 1979.
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Compliance: The proposed project would not stimulate development in the flood plain. Circulation of this report for public review fulfills the requirements of Executive Order 11988, Section 2(a)(2).

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: There will be no impacts to wetlands in the proposed project area. Circulation of the Draft EA for public review fulfills the requirements of Executive Order 11990, Section 2(b).

3. Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations, 11 February 1994.

Compliance: No impacts are expected to occur to any minority or low income communities in the project area. The Draft EA was made available for comment to all individuals who have an interest in the proposed project.

4. Executive Order 13112, Invasive Species

Compliance: Sections 3.2.1.4 and 4.2.1.4 of this document address the impacts of the proposed project on invasive species. The project will not spread or introduce invasive species to the project area.

Executive Memorandum

1. Analysis of Impacts of Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: The project does not involve or impact agricultural lands.

5.0 LIST OF PREPARERS

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6.0 PUBLIC INVOLVEMENT

The draft EA and FONSI will be made available to the public by notice of availability for a 30-day review and comment period with at least the following Federal, state and local agencies as well as local interests.

National Marine Fisheries Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Virginia Division of Soil and Water Conservation
Virginia Office of Environmental Impact Review
Virginia Department of Environmental Quality
Virginia Department of Game and Inland Fisheries
Virginia Department of Historic Resources
Virginia Institute of Marine Science
Virginia Marine Resources Commission

Comments which are received will be addressed in the comment andresponse section and will be included in the final version of this document. A FONSI will be published and those commenting will also receive a copy of the EA

7.0 CONCLUSION

The goals of this project are to restore of a self sustaining oyster population and to improve the environmental quality of the Piankatank River. Project goals would be achieved through the construction of new sanctuary reefs, using alternative substrate or the combination of alternative substrate and oyster shell. Construction of the project will include temporary, minor impacts to air quality, water quality, the aquatic community, recreation, navigation and the level of noise experienced within the project area. It is predicted that these negative impacts will end once construction has been completed and most environmental parameters within the project area will return to pre-construction conditions. The long-term impacts resulting from the project are predicted to be largely beneficial. The new reef structures increase habitat heterogeneity and increase the amount of reef habitat within the river. The reef will increase productivity of the system and provide habitat for prey species, such as crustaceans, mollusks, worms and fish. Hard reef structures will provide cover and shelter for many species of fish and other motile invertebrates such as crabs and shrimp as well as attachment surfaces for sessile organisms. Mitigation actions that will be implemented for the proposed project include best management practices set in place during construction to reduce impact to water quality and the inclusion of signs that the site of newly constructed reefs. Coordination with the resources agencies is ongoing and may yet yield additional mitigation requirements. The implementation of the proposed action would not have a significant adverse impact on the quality of the environment, and an environmental impact statement is not required.

8.0 LIST OF ABBREVIATIONS

CBP - Chesapeake Bay Program
CSO - Combined Sewer Overflow
CWA - Clean Water Act
CZMA - Coastal Zone Management Act
DEQ - Department of Environmental Quality
DO - Dissolved Oxygen
EA - Environmental Assessment
EFH - Essential Fish Habitat
EO – Executive Order
ESA - Endangered Species Act
FONSI - Finding of No Significant Impact
HAPC - Habitat Area of Particular Concern
HMS - Highly Migratory Species
JPA - Joint Permit Application
MPA - Marine Protected Areas
MSFCMA - Magnuson-Stevens Fishery Conservation and Management Act
NAA - No-Action Alternative
NAAQS - National Ambient Air Quality Standards
NEPA - National Environmental Policy Act
NHPA - National Historic Preservation Act
NMFS - National Marine Fisheries Service
NOAA – National Oceanographic and Atmospheric Administration
NRHP - National Register of Historic Places
NWI - National Wetlands Inventory Project
OMW - Oyster Metric Workgroup
PCB - Polychlorinated Biphenyls
RTE - Rare, Threatened, or Endangered
SAV - Submerged Aquatic Vegetation
SERC - Smithsonian Environmental Research Center
SLC - Sea Level Change
SLR - Sea Level Rise
SSO - Sanitary Sewer Overflow
TMDL – Maximum Daily Load
TNC – The Nature Conservancy
TSS - Total Suspended Solids
USACE – United States Army Corps of Engineers
USEPA – United States Environmental Protection Agency
USFWS – United States Fish and Wildlife service
USGS - United States Geological Survey
VCRIS - Virginia Cultural Resource Information System

VDHR - Virginia Department of Historic Resources
VDGIF - Virginia Department of Game and Inland Fisheries
VHD - Virginia Department of Health
VIMS - Virginia Institute of Marine Science
VMRC – Virginia Marine Resources Commission
VOSARA - Virginia Oyster Stock Assessment and Replenishment Archive
WRDA - Water Resources Development Act

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DRAFT FINDING OF NO SIGNFICANT IMPACT

CHESAPEAKE BAY NATIVE OYSTER RESTORATION PROJECT
PIANKATANK RIVER, VIRGINIA

I have reviewed and evaluated the Environmental Assessment (EA) for this project in terms of the overall public interest. The overall purpose of the Chesapeake Bay Native Oyster Restoration project in the Piankatank River is to reestablish self-sustaining oyster populations and habitat that resembles natural conditions in terms of structure and function as authorized by Section 704(b) of the Water Resources Development Act (WRDA) of 1986, as amended. The Preferred Alternative and the No Action Alternative (NAA) were the only alternatives carried forward for detailed evaluation. The recommended plan involves the construction of sanctuary reefs, through the use of alternative substrate or a combination of alternative substrate and oyster shell. .

The Norfolk District has taken reasonable measures to assemble the known or foreseeable impacts of the project in the report. The possible consequences of the Preferred Alternative and NAA were considered in terms of probable environmental impact, social well- being, and economic factors. This report presents the impacts that could potentially result from restoration efforts. All adverse effects of project implementation are considered insignificant and are temporary in nature.

The adverse environmental impacts of the project were not found to be significant. Construction of new reefs may result in decreased water quality due to the disturbance of bottom sediment. These activities may result in decreased levels of dissolved oxygen and increased amounts of total suspended solids and turbidity in the water column. These impacts will dissipate quickly after construction has been completed.

No expected adverse effects on threatened or endangered species or species of special concern are foreseeable with project implementation. However, monitoring measures and other precautions would be put in place if advised by the National Oceanographic and Atmospheric Administration (NOAA) in order to avoid jeopardizing the continued existence of threatened and/or endangered species. Endangered Species Act, Section 7 consultation, may be undertaken and would conclude with a NMFS Biological Opinion.

No significant economic or social well-being impacts that are both adverse or unavoidable are foreseen as a result of the proposed action. The project will not have any impact on known sites of known significant archeological or historical importance.

Under the NAA, the project area will not naturally return to a productive state for oysters and will instead remain as degraded oyster habitat. It is likely that remaining oyster habitat will continue to be lost to degradation due to low population levels, sedimentation, disease, predation and ongoing fishing.

The conclusions of this report are based on an evaluation of the effects that the proposed action would have on the entire ecosystem, including the land, air, and water resources of the Piankatank River. Cumulative impacts of other activities were also considered in this evaluation. Implementing the Preferred Alternative would not have a significant adverse effect on the environment. Design features and best management practices that will minimize adverse impacts will be incorporated into the project. The effect of the proposed action would not be environmentally controversial.

The long-term benefits to the ecosystem of the Piankatank River would be positive as a result of project implementation. In addition to increasing habitat heterogeneity, the new reef structures will produce other long-term benefits. The reef will increase productivity of the system and provide habitat for prey species, such as crustaceans, mollusks, worms and fish. Hard reef structures will provide cover and shelter for many species of fish and other motile invertebrates such as crabs and shrimp as well as attachment surfaces for sessile organisms.

Due to the absence of significant adverse environmental impacts, an Environmental Impact Statement will not be required.

____________________	____________________________
Date	PAUL B. OLSEN, P.E. Colonel, Corps of Engineers Commanding